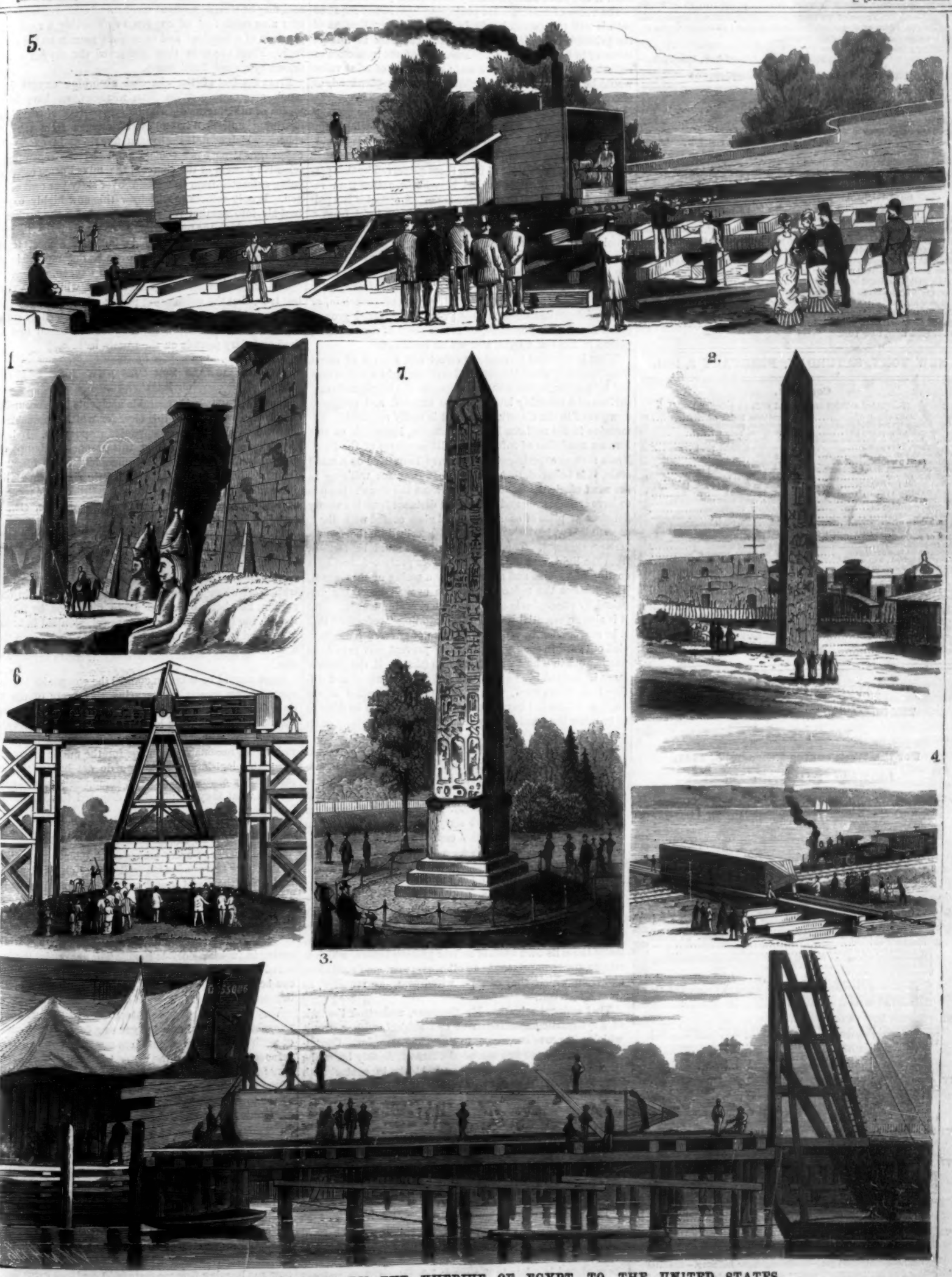
SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLIV.—No. 6. [NEW SERIES.] NEW YORK, FEBRUARY 5, 1881. [$3.20 per Annum. [POSTAGE PREPAID.



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Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

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STREET ILLUMINATION.

Almost the first thing that strikes the scientific economist, when gazing upward in admiration at one or other of the numerous electric lights now being introduced in our streets, is the extremely small percentage of the light really utilized for achieving the purpose intended, viz., the effective lighting of the streets and thoroughfares. Somewhat more than one-half of the light emitted is totally lost, a fact scarcely requisite to be pointed out to any one acquainted with the rudiments of optical science, seeing that all light that passes upward into space rather than in the direction into which it is required must, for that requirement, be assumed to have no existence. The fifty per cent passing upward and outward is not more metaphorically than literally *in nubibus*.

The value of reflectors for projecting light in any required path is well recognized by all, but the proper application of the principles of reflection and diffusion appears in a large measure to be lost sight of. Divested of the reflectors or refractors to which they owe their efficiency, of what value would be the lamp in the lighthouse, at the pier-head, or affixed to that of the railway locomotive?

A parabolic reflector is that which utilizes to the greatest extent the light emanating from any lamp; but owing to the very perfection of this form it is quite unserviceable in aiding street illumination, the conditions of which demand something entirely different from those subserved by that perfect reflector. What is wanted is *radiation* rather than reflection in the optical sense of the term. A reflector is a polished surface, any one part of which reflects light from a radiant according to the law of the angle of incidence being equal to that of reflection; a radiator, on the contrary, possesses a surface from which is emitted in every direction the light that falls upon it. A silvered glass or polished metallic surface represents the former; a type of the latter being a sheet of white cardboard, a surface of porcelain, or of silver deposited upon *ground* glass. Unsilvered ground glass, translucent porcelain, or even a sheet of tissue paper, placed in front of a light, also act as radiators.

What is required to render perfect our system of street illumination by electric lamps is that all the light which is now lost by passing upward shall, by means of a bright radiating surface of a tolerably large area, be arrested and projected downward in the direction where it is really required. Dimension in the radiator is of importance, inasmuch as this forms a condition of softness and diffusiveness of the light. From several experiments which have been tried on a small scale, it is believed that a valuable means for utilizing in the most efficient manner the light from the electric lamp is to have erected over and at no great distance from it a nearly flat circular plate of coarsely ground glass coated with silver, according to the manner recently described in the SCIENTIFIC AMERICAN. The ground surface should be farthest from the light, and the deposit of silver protected first by a coating of varnish and afterward by a casing of thin metal. This insures the reflecting surface against becoming impaired by atmospheric or other deleterious influences. But it is also an essential part of this radiating "reflector" that it be surrounded by a deep edge, also of silvered glass, beveled outward in such a degree as to prevent any rays from passing out in a horizontal direction (that is, if the electric lamp be erected high overhead), but so as to arrest and diffuse them downward, which, by a proper selection of the angle at which the bevel is given to the edge, can be done so as to cause the greatest benefit to be received by those parts at a distance away from the lamp.

In such cases where it is desirable to hide the light itself from the eye this may be done in the best manner by the interposition of a plate of ground glass, which, of all other diffusers or radiators, is found to absorb less of the light than any other diaphanous body. Some kinds of porcelain shades are known to absorb sixty per cent of the light; to ground glass such an objection cannot apply.

UNRECOGNIZED QUALITIES IN CHARCOAL.

Among the numerous and varied properties possessed by charcoal there is one—one, too, of the most wonderful—which does not seem to be adequately recognized, probably from its being imperfectly known except to physicists. It is that of being able to condense and store away in its pores many times its own bulk of certain gaseous bodies, which it retains, thus compressed in an otherwise unaltered condition, and from which they can be withdrawn, as required, as from a reservoir.

That eminent scientist, M. Saussure, undertook the task of a systematic examination of this subject, with a result which will prove surprising to the general reader. Operating with blocks of fine boxwood charcoal, freshly burnt, he found that by simply placing such blocks in contact with certain gases they absorbed them in the following proportions:

Ammonia	90	volumes.
Hydrochloric acid gas	85	"
Sulphurous acid	65	"
Sulphureted hydrogen	55	"
Nitrous oxide (laughing gas)	40	"
Carbonic acid	35	"
Carbonic oxide	9·42	"
Oxygen	9·25	"
Nitrogen	6·50	"
Carbureted hydrogen	5	"
Hydrogen	1·75	"

It is this enormous absorptive power that renders of so much value a comparatively slight sprinkling of charcoal over dead animal matter as a preventive of the escape of the odors arising from decomposition. A dead dog having been placed in a box in the warm laboratory of an eminent chemist, and covered with charcoal to the depth of between two and three inches, could not be discovered to have emitted any smell during several months, after which time an examination showed that nothing of the animal remained but the bones and a small portion of the skin. To the large excess of oxygen over the nitrogen in the atmosphere, which, according to the above table, was absorbed by the charcoal, and which thus rendered harmless the noxious vapors given off by the carcass as they were being absorbed, is doubtless owing the fact above stated and the further fact of the charcoal never becoming saturated.

A reader of the SCIENTIFIC AMERICAN who has been trying certain experiments on the value of charcoal as a convenient means of storing oxygen, reports favorably as to the results. In a box or case containing one cubic foot of charcoal, may be stored, without mechanical compression, a little over nine cubic feet of oxygen, representing a mechanical pressure of a hundred and twenty-six pounds on the square inch. From the store thus preserved the oxygen can be drawn by a small hand pump.

From the fact of the charcoal absorbing oxygen in so much greater proportion than nitrogen, we have here a means of utilizing its discriminative powers of selection in obtaining unlimited supplies of oxygen from the atmosphere, which contains nitrogen five times in excess of its oxygen, or twenty per cent; whereas by the separating or selective powers of the charcoal the mixed gases capable of being extracted from it contain over sixty per cent of oxygen. It only suffices to withdraw this now highly oxygenized air into another vessel of charcoal, by the further exposure to which the proportion of oxygen will be increased to a still greater extent. This indicates a most feasible means by which atmospheric air can be decomposed in such a way as to provide a cheap supply of oxygen.

One cannot readily recognize the fact, which is nevertheless true, that the condensing power of charcoal as applied to ammonia is equal to what would be obtained by subjecting this gas to a pressure of nearly one thousand two hundred and sixty pounds on the square inch.

ELECTRIC SIGNALS FOR THE NEW YORK ELEVATED RAILWAYS.

A series of utterly inexcusable accidents have occurred on the elevated railways of this city, for which reasonable men will, we think, hold the companies responsible. It is easy to make a show of shifting this responsibility upon employes; but, so long as the companies persist in running these roads without providing electric signals, and all the other safety appliances used on our railroads, the recurrence of collisions, derailment at misplaced switches, etc., may certainly be expected.

The neglect to provide electric signals is all the more culpable when the comparatively small outlay required to supply them is considered.

The theory that accidents can be avoided on a double-track road when trains on the same track run all in one direction, has been over and again disproved by facts, and though the list of accidents has, as yet, resulted in little loss of life and small personal injury, this has been due rather to a fortunate concurrence of circumstances than to anything else.

Steps should be taken to compel the companies to provide every known means for securing the safety of the many thousands of people who daily trust their lives upon the elevated railways. The holders of these monopolies should be made to feel the full weight of public opinion till they yield to all reasonable demands for the public safety.

Suitable legislation, which we do not believe they could successfully obstruct or defeat, should be at once begun to compel what they do not seem disposed to voluntarily perform.

GAS IN STEEL AND GLASS MAKING.

A few years ago every maker of crucible steel in the city of Pittsburg surrounded his frail pots of clay and plumbago with coke, the direct heat from this fuel melting the metal. To-day finds every one of these furnaces discarded, and the regenerative Siemens gas furnace has supplanted the coke burning ones. As a consequence, instead of two heats, five or even six heats are obtained from each crucible, while the saving in fuel is a notable item. The gas producing furnace is fed with a grade of bituminous coal which in many cases can be had for the hauling. Such in brief is an outline of the results attained in the use of gas in steel making.

Very recently a glass manufacturer of Pittsburg has, with remarkable success, adopted gas as a fuel in the converting of a "batch" of ingredients into molten glass, and his little furnace is an object of the deepest interest to the glass makers of Pittsburg and elsewhere. The glass melting furnace of the present is in principle that of the furnace of a century ago, a towering mass of refractory brick, holding at its base a collection of costly and fragile "pots," containing usually 2,000 pounds of molten glass each, these pots being exposed to the direct heat of burning coal beneath. The extreme tenderness of these pots, their liability to deposit their costly contents into the ash pit, their first cost, about $50, and the care necessary in preserving them from sudden lowering of temperature are a few only of the objections that have always existed in the orthodox form of furnace. In the best of these a pound of melted glass produced for a pound of coal burned is considered extremely good results and the first cost of such a furnace is $6,000. On the other hand, the new gas burning furnace costs $500, and in it every day there is melted a 6,000 pound batch with 1,000 pounds of "nut"

coal in 12 hours after lighting the fires, against 24 to 36 hours in the old furnace.

The new or "open tank" glass furnace is built of fire-brick, and is of the subjoined modest proportions. The "tank," holding 6,000 pounds of glass, is 7 by 5 by 2 feet. Across one end of this space, and separated from it by a fire wall, is the furnace or fire box. This is simply a fireplace, 30 inches square, furnished wth grate bars, and not differing in appearance from the ordinary furnace under a steam boiler. To this fire box is led air from a rotary blower. This finds its way to the grate bars and through flues in the surrounding wall. In the latter instance this air becomes intensely hot before escaping through suitable openings and mingling with the products of the burning coal. So mingled, air, smoke, and gases blend in a flame of intense heat, and following the draught pour over the fire wall and down upon the tank, converting the "batch" into molten glass in the time stated. It should be added that the old style furnace, with its great mass of brickwork, requires two weeks of continuous firing to make ready for melting, and that skilled labor, "teasing," is necessary to properly preserve the pots from undue heat or cold.

The new furnace is the invention of Mr. Thomas Atterbury, of Pittsburg, and an inspection of the operation of the gas furnace warrants the supposition that the days of the old style and time-honored furnace are numbered.

TREES IN CITIES.

An interesting paper has been recently read by Dr. Phené at Edinburgh on the benefits to be derived from planting trees in cities. Among the beneficial results to be attained are, he stated, the relief to the optic nerve through the eye resting on objects of a green color. Just that which is effected by the use of green or blue glasses in strengthening and sustaining the power of sight, is attained, or, at any rate, much aided, by the presence of green in nature; and in streets the only method to procure this result is by planting trees. It was pointed out by the author that wherever opportunity exists nature provides green and blue (the latter being the same color minus the presence of yellow), and that as the absence of color produces snow blindness, and in tropical calms, where the ocean presents only a white reflected light from a uniform glassy surface, reduced optical power soon follows a long continuance of the absence of blue color, which becomes immediately apparent on motion of the waves.

So in the streets, to the occupants of houses having a northern aspect, the glare of the reflected light is injurious; but the effect would be much modified by the coolness to the eye produced by the green of trees. In ancient surgery, persons having weak or declining sight were advised to look at the emerald. In the old style of building, the streets being narrow, were both cooler, from the sun not being able to penetrate them with direct rays, and less subject to noxious exhalations from the scouring and purifying effects of the searching air to which the narrow streets were subject, so that while there was no space for trees there was also less necessity. Wide streets, on the contrary, are hotter, and require the shade of trees to cool them; and, as in the case of London, which had so far done without trees in its streets, it was pointed out that not only are modern streets compulsorily wide, but that the enormous increase in metropolitan buildings render every sanitary question one of importance; and the chemical properties of trees as shown by experiment give them an important standing, irrespective of ornament or the pleasure they produce. Some of Dr. Phené's experiments on this subject have extended over a period of thirty years, and he it was who first tried the planting of trees in the streets of London. Since the reading of a former paper by him at Manchester, wherein the importance of the subject was pointed out, a number of streets in wealthy localities have been planted, and even Trafalgar Square, in the heart of the metropolis.

SINGULAR DISCOVERY IN CONNECTION WITH PHOSPHORESCENCE.

The property possessed by certain metallic sulphides and other phosphorescent bodies of absorbing light when exposed to its influence, and giving out the same when brought into a darkened room, has long been known to scientists, but it is only quite lately that efforts have been made to utilize such properties. Of these, the most striking consisted in spreading a sulphide of this nature upon a flat tablet and exposing it to strong light for a few seconds under an ordinary photographic negative. Upon removing the tablet thus impressed into a dark room, the pic ture on it will be found to be glowing in quite a mysterious and wonderful manner, and it will continue for some minutes to radiate the light which it absorbed.

It has occurred to an ingenious physicist, A. L. Henderson, to mix one of the most sensitive of these phosphorescent metallic sulphides with the bromide of silver, now so generally employed in the preparation of photographic dry plates, and, after emulsifying this mixture with gelatine, spreading it upon the surface of glass plates, and treating the same as ordinary ones except in so far as regards the exposure, which must be momentary. He appears to have reasoned in this way: With even the briefest exposure capable of being given, a certain modicum of change will be produced on the sensitive bromide of silver, although manifestly such as will be incapable of yielding a properly developed image. But the light also falls upon the atoms of the phosphorescent powder incorporated in the films: and as these in turn radiate such light, it follows that they will complete the imperfect exposure set up in the bromide by the direct action of the light.

This reasoning has been found correct, and the result at present stands that plates have been prepared having such exceeding sensitiveness as to be well impressed by what Mr. Henderson designates "the flash of a match."

Phosphorescent sulphides may easily be prepared by heating the carbonate of lime, of barytes, of strontia, or other carbonate found most suitable, in a covered crucible with half its weight of sulphur. After an hour's exposure to heat the preparation is complete and phosphori are obtained which, upon being briefly exposed to light and then withdrawn into a dark room, will be seen to glow brightly, the color of the light emitted depending upon the nature of the carbonate originally selected.

This application of a well recognized fact in phosphorescence is so novel, and calculated to be of so much use, that we have no doubt its progress toward development will be rapid.

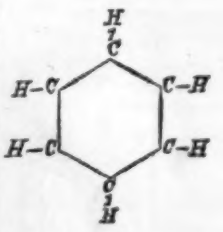
A DESCRIPTION OF CAUCASIAN PETROLEUM.

It has been known for years, if not for centuries, that combustible gases escaped from the earth at Baku, in the Caucasus, yet no one seems to have suspected that Baku was destined to become as famous for its oil springs as our own Pennsylvania. Recently, however, the production of Caucasian petroleum has been such as to interfere with the sale of American petroleum in Russia. Two of the foremost chemists of St. Petersburg, Messrs. Beilstein and Kurbatow, have subjected this oil to a critical examination, which is given in full in the *Berichte* of the German Chemical Society.

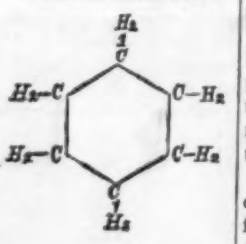
The peculiarity of this petroleum from Baku consists of its high specific gravity as compared with American petroleum of the same boiling point. For a long time this fact caused the consumers to be mistrustful of their own oil. Wilm and Biel, however, proved that the Russian oil gave ten per cent more light than the American, and Biel also found that the illuminating oil even of this high gravity was drawn up the wick to the flame more easily than the American oil. Since that time the public prejudice has disappeared, and the importation of American oil into Russia has as good as ceased entirely. The high gravity of Caucasian oils is taken advantage of by the manufacturers of lubricating oil, and at present a lubricator with a gravity of 0·940 is made without adding any solid substance, which has already found extensive use in Europe.

The oils examined by Beilstein and Kurbatow was the first distillate obtained by a careful distillation of crude oil. Although they submitted it to fractional distillation nine times with the aid of Glinsky's dephlegmator, they did not succeed in obtaining any products with constant boiling points. That which boiled below 176° Fah. had a specific gravity of 0·717, while American petroleum of like boiling point had a specific gravity of only 0·669. The portion distilling over between 200° and 212° had a density of 0·748, the American of 0·699. At first they were inclined to attribute this to the admixture of hydrocarbons of the aromatic series like benzol, C_6H_6; toluol, C_7H_8, etc. On shaking it with fuming sulphuric acid they were unable to detect a trace of any aromatic hydrocarbon. An ultimate analysis of that boiling about 185° corresponded nearly with the formula C_7H_{14}, while the American oil of 205° to 212° is nearly C_7H_{16}, showing that the Caucasian petroleum is *poorer* in hydrogen than the American. Yet it does not consist of homologues of ethylen (C_2H_4), because bromine did not act upon it until heated, when hydrobromic acid was copiously evolved, showing that substitution had not taken place. A farther study of these products convinced these investigators that they were dealing with the hydrogen addition products of aromatic hydrocarbons, such as hexahydrobenzol C_6H_{12}, hexahydrotoluol C_7H_{14}. The graphic formula of the former is given below:

BENZOL.



HEXAHYDROBENZOL.



A very unusual circumstance for a petroleum was the action of nitric acid (sp. gr. 1·38). When boiled until red fumes ceased the acid liquid contained acetic and succinic acids; the oily portion contained a liquid boiling at 410° to 420° Fah., and having the formula, $C_6H_{11}NO_3$. This may be either a nitrous ether, or a true nitro-compound, a very surprising fact in petroleums.

The different petroleum wells of the Caucasus yield oil of varying composition, according to their situations. Those examined came from the wells of Messrs. Von Benkendorff. Others will soon be examined by the same persons.

October 8, 1880. B. B.

Chemical Research by Means of Photography.

By the use of the electrical spark and a photographic apparatus the presence of very minute quantities of certain substances in certain liquids may be readily detected. The liquid to be examined is placed in a vessel, the sides of which are composed of quartz, which is one of the few purely transparent substances. If one part, by weight, of the coloring matter known as anthracene is mixed with fifty million times its weight of alcohol the presence of the color may be detected by a gelatine plate photograph taken as above, which will show the characteristic bands of the absorbed rays pertaining to anthracene.

ELECTRO-METALLURGY.

SILVER DEPOSITS.

For electro-silver plating the double salt of silver and potassium cyanide is almost universally employed. The baths are used either hot or cold. The latter method is generally adopted for articles which require great solidity. The hot process is used for small articles, and is preferable for steel, iron, zinc, lead, and tin, which have been previously electro-coppered. The hot baths are generally kept in enameled cast iron kettles, and the articles are either suspended or moved constantly about in them. A somewhat energetic current is needed, especially when the articles are moved about in order to operate rapidly. A gray or black deposit indicates too strong a current, and when the surface becomes covered with bubbles of gas the same thing is indicated. The anodes are plates of silver or heavy silver foil. The wooden tanks for the cold baths are similar to those used in plating with copper and nickel, but should be very thoroughly coated on the inside with gutta-percha.

THE BATH.

Water (soft)	1	gallon.
Cyanide of potassium (pure)	8	ounces.
Nitrate of silver	5¼	"

Dissolve the nitrate of silver in a sufficient quantity of pure water (soft), and add to it gradually, with constant stirring, hydrocyanic (prussic) acid until all the silver has been precipitated as cyanide, which may be known by the formation of no cloud in a portion of the clear liquid when a drop of the acid is added to it—avoid adding an excess of the acid. Throw the precipitate upon a fine cotton cloth filter, and as the liquid runs through wash the precipitate on the cloth several times with pure water. Dissolve the cyanide of potassium in the water, and stir in the cyanide of silver carefully removed from the cloth. If it does not dissolve in the liquid entirely, add more cyanide of potassium until it does, stirring continually. Let the impurities settle, and the bath is ready for use. Many electroplaters use a preliminary or silver "whitening" bath, which is the same composition, but contains less silver, more cyanide, and is worked with a somewhat stronger current.

The cleaned article in some cases is first dipped for a few moments in a solution of nitrate of mercury, one ounce in one gallon of water, and then in the whitening bath for a few minutes, and after brushing is transferred to the silver bath proper.

The vessels containing the cold bath are sufficiently high to allow about four inches of liquid above the immersed objects, whose distance from the bottom and sides should be nearly the same to give a regular deposit of metal at both ends of the object.

The upper ledge of the trough carries two brass rods all around, which do not touch one another, one above the other, so that other metallic rods placed transversely will rest upon the higher or lower series of rods only. The upper rods are connected with the zinc, the lower with the carbon or copper end of the battery, or with the corresponding poles of the dynamo-electric machine. The transverse rods resting upon the lower set support the silver anodes; those resting on the upper set, the work. The work suspended from an upper transverse is placed so as to face two anodes suspended from two lower transverse rods.

As the lower layers of the bath are apt to become denser (richer) than the upper, it is often necessary to reverse the articles during the operation to obtain a perfectly uniform thickness of deposit. For the same purpose small articles should be kept in motion as much as possible.

The deposit is finer and denser if obtained with a weak battery and long exposure than if a strong current is employed. A sufficient quantity of silver may be deposited in three or four hours, but it will be of much finer quality and more easily burnished if the work is left in the bath for twelve or fifteen hours with a few cells of battery.

When the articles, especially coppered iron, etc., have acquired a coherent film of silver, they are sometimes removed from the bath and thoroughly scratch-brushed, cleansed in alcohol, or preferably in a hot silvering bath, thence again passed through the mercurial solution and finished in the cold plating bath.

The first scratch-brushing, which is not always necessary, obviates the tendency of certain alloys to assume a crystalline appearance and corrects the imperfections of the cleansing in process.

Should the anodes become black during the passage of the current the solution contains too little cyanide. In this the deposit is adherent, but too slow; and the bath loses more silver than it can gain from the anodes.

If the anodes remain white during the passage of the current the bath contains an excess of cyanide, and the deposit does not properly adhere; correct by adding cyanide of silver until it dissolves with difficulty.

When in good working order the anodes present a gray appearance while the current is passing, becoming white when circuit is broken.

The specific gravity of the bath may vary from 5° to 15° Baumé's hydrometer and still furnish good results.

Electro-silvering baths do not generally work so well when freshly prepared. If properly used and cared for they improve by age. At first the deposit is often granulated, bluish or yellowish.

It is customary to mix portions of an old bath with a freshly prepared one. Some platers introduce small quantities of ammonia instead to age the liquid.

Bisulphide of carbon in small quantities imparts a bright luster to plated articles. An ounce of the bisulphide is put into a pint bottle filled with a strong solution of the cyanide of potassium and silver, briskly shaken, and a few drops of this liquid poured into the bath occasionally until the work appears sufficiently bright. An excess of bisulphide must, however, be avoided, as it will spoil the bath.

What has been said about the arrangement of battery in articles of nickel and brass plating will also apply here. (See p. 153, vol. xliii., and 4, current volume.)

Electric Light Experiment.

The recent experiment of lighting the Hoosac (Mass.) Tunnel with electricity was with an apparatus placed on a platform car which was pushed slowly along by a locomotive. The generator of 4,000 candle-power was operated by an engine of 20 horse power, and each of the burners was of 2,000 candle-power. In the parts of the tunnel free from smoke the light was thrown strong enough to do track work over 500 feet away, and driving spikes and shoveling 1,000 feet off. Between the central shaft and the east portal, where the smoke was so dense that an ordinary locomotive light would not be visible 10 feet away, the electric light could be seen for over 100 feet. In some parts of the tunnel one could read by the electric light 250 feet from the car. The State authorities are soon to witness an experiment, and it is probable that the improvement will be adopted. If the electric lights are adopted power can be supplied from a turbine water wheel now lying idle in a shop at the east end. It is thought that twelve lanterns will light the tunnel, except when the smoke is unusually dense.

IMPROVED LOCK FOR MUSEUM CASES.

The difficulty of properly fastening the doors of museum, cabinet, and library cases in institutions where such cases are employed in large numbers, is only too well appreciated by those having such matters directly in charge. The usual method of bolting one of a pair of doors and locking the other, or of locking both doors simultaneously where cases are numerous, entails a great deal of labor, beside incumbering the person doing it with a weight of keys that is really burdensome.

We give herewith engravings of an improved system of locking mechanism for museum doors, by means of which an almost unlimited number of doors and drawers may be securely fastened by a single operation. This invention has been practically tested in the Museum of the University of Michigan, where its application to the newly-built cases effected a saving of $800, beside furnishing a complete fastening, which not only holds the doors securely, but draws them into place should they be left slightly ajar before locking. The inventor has shown us letters from several of the professors in the Michigan University indorsing the lock in the highest terms.

The bolt consists of a steel rod extending along the top and another at the bottom of the series of doors, and carrying beveled hooks capable of engaging sockets or eyes attached to the doors. The rods are supported at suitable intervals by guides attached to the casing of the doors. In like manner a rod extends over a series of drawers and carries hooks which engage sockets attached to the sides of the drawers. The upper and lower continuous bolts are each connected to a bell-crank lever, and the two levers are connected by a vertical rod, so that the bolts will move simultaneously in the same direction. The vertical rod is connected with a lever whose pintle extends through an opening in the front of the case, and is capable of being turned by a key adapted to it. The opening in the front of the case is closed by a small door, which is locked by means of a fine lock and key of approved make.

The bolt which locks the drawers is connected with the lower door bolt by a lever, so that when the key is turned, the bolts at the top and bottom of the doors and at the top of the drawers are all moved at once, permitting of opening any of the doors or drawers in the case. The bolt may be applied to cases containing any number of doors, and in fact to any number of cases if desired, so that one motion locks or unlocks the entire series. When the doors are closed and bolted the key is removed, and the small door which covers the pintle of the unlocking lever is locked by a single key, rendering all secure by the use of a single key weighing but the fraction of an ounce, and capable of being carried without the slightest inconvenience. These bolts are very cheaply made, and yet strong and durable, and capable of accomplishing all that is required of them.

This useful invention was recently patented by Mr. Andrew Climie, of Ann Arbor, Mich.

CLIMIE'S MUSEUM CASE LOCK.

BUTTER COOLER AND WATER HOLDER.

The engraving shows a novel device for holding water and cooling butter. It consists of a water bottle, having a deeply-recessed bottom, and a butter plate of sufficient size

COMBINED BUTTER COOLER AND WATER HOLDER.

to receive the base of the bottle. The cavity in the bottle is sufficiently large to inclose the butter without touching it, and the bottle, when in use, is filled with water and ice in small pieces.

This invention was recently patented by Mr. P. Dorlon, of Brooklyn, N. Y.

Mr. Oliver Byrne.

We record with regret the death of Mr. Oliver Byrne, C.E., who died at Grecian street, Maidstone, England, on December 9, 1880, aged 70 years. For some time past he had been in failing health, and lived a retired and secluded life. About two months ago, when in London, he caught a violent cold, which terminated in inflammation of the lungs, involving the smaller bronchial tubes, from which he gradually sank. Mr. Byrne was the author of several engineering works, and notably editor of, and a large contributor to, "Spons' Dictionary of Engineering." He was the inventor of the dual system of arithmetic, for which he claimed many peculiar advantages.

MISCELLANEOUS INVENTIONS.

A reel for measuring bagging, patented by Mr. Charles J. Le Roy, of Palestine, Texas, may be used for handling, measuring, and cutting bagging, matting, carpet, etc. It consists of a spool or roller from which the stock is taken, a reel upon which it is wound from the roller, a cutting board or table, and a measuring wheel, by which the operations named are simply, accurately, and easily performed.

In a button hole attachment for sewing machines, patented by Mr. John K. Harris, of Springfield, Ohio, an automatically acting and adjustable feeding device gives the cloth an intermittent lateral movement combined with a forward movement by improved devices, whereby an extra pressure of the presser piece upon the cloth is obtained, the locks of the stitches are caused to terminate in a straight line either above or below the surface of the material or at the edge, according to the regulation of the tension, and all upword or downward motion of the goods around the needle is prevented.

A feather renovator, patented by Messrs. Jefferson Hatch and Leonard Fortune, of Felt's Mills, is intended for cleansing feathers before using them for beds, both when new and after they have been used. The feathers are placed in a rotating cylinder, in which the feathers are subjected to the action of a strong blast which issues from openings in the hollow shaft of the cylinder, through which air is blown by a fan blower, the air finding outlet through a perforated or reticulated door in the side of the cylinder, through which the feathers are put in and taken out.

Mr. William A. Jennings, of Dyersburg, Tenn., has patented a clevis that may be adjusted to draw-beams of different dimensions. Two bars are hinged to the ends of a link. A screw bolt is pivoted to the free extremity of one of the bars, and its threaded end passes through an eye in the free end of the other bar, where it may be secured by a nut. The pivoted bolt is passed through a hole in the beam to which it is desired to attach the clevis.

A skirt ironing board, patented by Mary H. Baldwin, of Hamlin, Texas, has hinged detachable leaves, with devices for holding the leaves open, the board being hinged to a frame, the lower part of which forms a box for receiving that part of the article which hangs down, to protect the same from dust and dirt and to keep it moist.

A jack screw, patented by Mr. William H. Williams, of Key West, Florida, appears a very effective device for raising heavy weights. A peculiarly constructed detachable pawl, combined with a bifurcated lever for actuating the screw, is the main feature of the invention. The construction of the pawl permits the screw to be worked in either direction according as the pawl is adjusted; its detachability affords means for preventing any tampering with the screw by unauthorized persons.

Mr. Karl Kreutzer, of New York city, has patented a game bat of that class having oval-shaped heads fitted with netting. He bends a piece of wood to the shape required, the strip having wire rods embedded into it at opposite sides throughout its length for strengthening the bat, and gore pieces fitted into the crotch in a peculiar manner to resist strain and prevent disconnection at that point.

Mr. Robert Watkinson, of Salford, England, has invented an improved coupling for hose and other pipes. The joints are formed by interlocking devices, assisted by an elastic packing, which not only maintains the locking of the parts after they are joined, but acts to tighten the joint through the action of interior pressure upon the packing.

An improved pile for the manufacture of composite metal plates, patented by Mr. Dolphus Torrey, of New York city, protects the metal forming the interior of the pile from the action of oxidizing flames and gases while in the heating furnace and immediately subsequent thereto. The pieces of metal forming the pile are so shaped that no bands, ties, bolts, or rivets are required to keep them in position. The pile is made of two plates and intermediate band and steel scrap, which fills the space inclosed by the plates and band.

Mr. Otis D. Thompson, of Elkhart, Ind., has patented an improvement in wind wheels, which consists in a novel construction, arrangement, and operation of the wheel and vane relatively to each other, whereby provision is made for throwing

the wheel out of wind when the current is too strong, and also for adjusting the sails to accommodate the wheel to the force of the wind.

MANY-COLOR PRINTING PRESS.

We present herewith a figure of a new press, which, with a single form and at a single impression, prints in several colors. This result is obtained by a special arrangement of the inking table, a full view of which is seen in the figure. This table, instead of being in a single piece, is composed of a certain number of narrow cast iron plates held in a frame. These plates are formed of four distinct parts, and are wide in the center and taper conically toward the extremity. This mode of construction allows them to move easily on each side at every revolution of the table, and has nearly the effect of an articulated joint. The end piece near the ink trough is stationary. The various colored inks are placed in the ink trough, which is divided into cells by metallic partitions. Directly over the trough is an iron frame carrying a set of screws and nuts. By tightening these screws, which are placed over the metallic partitions, the inks as they flow beneath are prevented from mixing. The inking rollers, instead of being fixed at a certain angle relative to the table, are arranged so as to run perfectly straight, the distribution being effected by the plates above described.

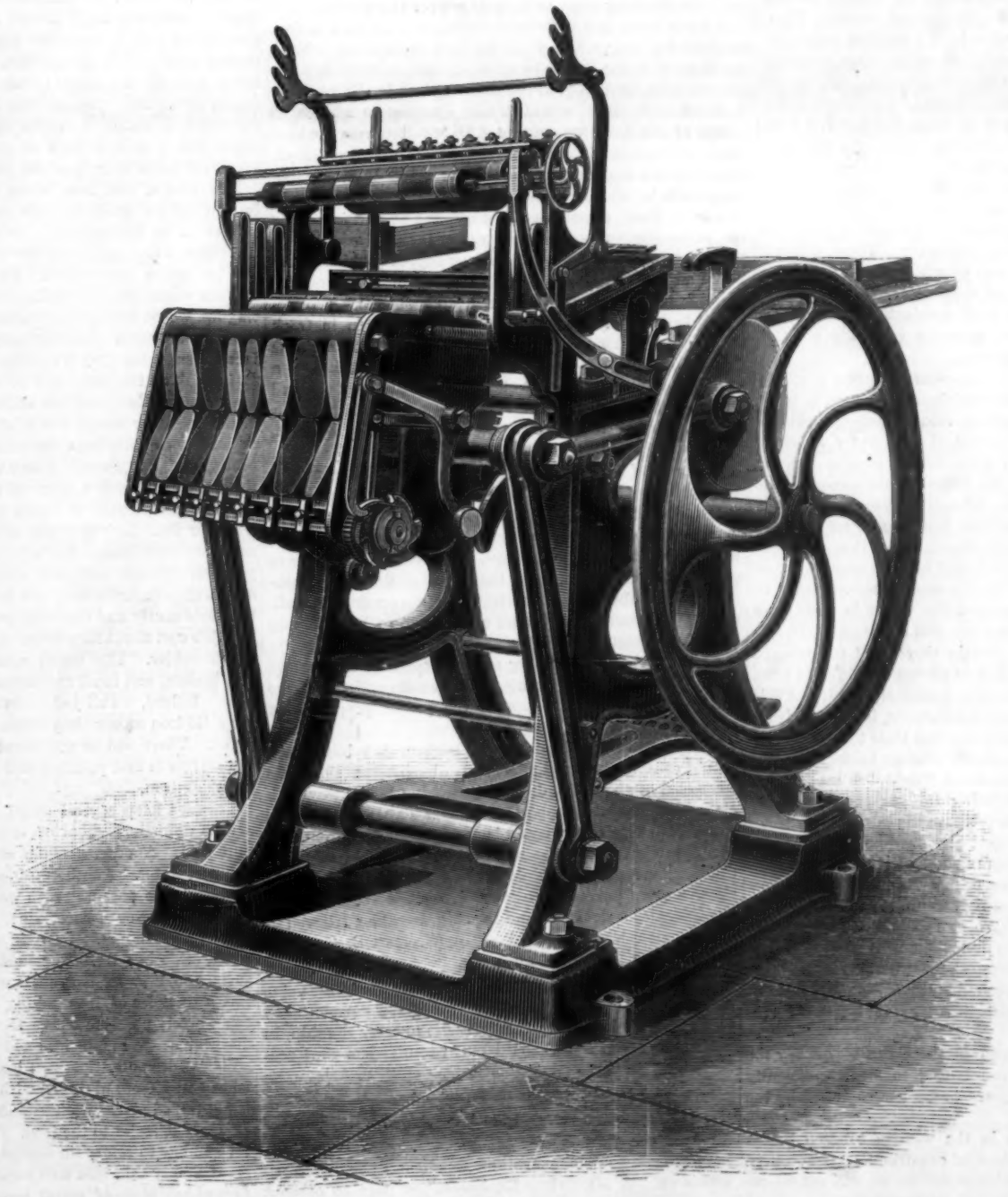
The different inks are spread on the multiple table in the usual way. As a consequence of the motion of the articulated joint, the inking table is caused to move slightly in one direction and the other at every revolution of the table, and the ink is thus as well distributed as if several rollers were used. The movable plates which constitute the inking table are of different widths, so that the uppermost or the lowest line in a prospectus can be printed in a color selected beforehand. Motion is communicated to the movable plates by a small lever which hangs under the table, and which rests on a small vertical iron plate affixed to a cross-stay of the machine.

The removal of an ordinary inking table and its substitution by the multicolorous one can be effected while the form is being prepared. There is, however, no reason why the articulated table should not be used for work in black; it is only necessary to have a sufficient number of plates to cover the whole breadth, and then the rollers may be allowed to run obliquely as usual. With this apparatus a demi-octavo prospectus may be readily printed in eight colors at a single impression, each color being brilliant and perfectly distinct from the others. As the rollers move in a perfectly straight line the inks do not mix, although the plates which carry them may be placed as close together as necessary.

This same system of multicolorous tables may be applied to various printing presses. The impression can be made in just as many colors as may be desired, and with such advantages it is certain that the use of such a method must become widespread for printing prospectuses, circulars, bills of fare, and other work of this nature. The apparatus will effect a complete revolution in colored work, since the difference in price between printing in black and printing in colors by the Bacon system is very slight, being merely the difference between the cost of black and colored inks. We should remark, in conclusion, that two colors cannot be printed on the same line—neither in initials nor in borders—since the colors are arranged in a straight line; but it will be readily understood that, by superposing the colors and taking several successive impressions, the most varied effects may be obtained.

This machine attracted considerable attention at the late fair of the American Institute.

T. Sarony-Lambert, Room 5, Bennett Building, New York City, is agent.

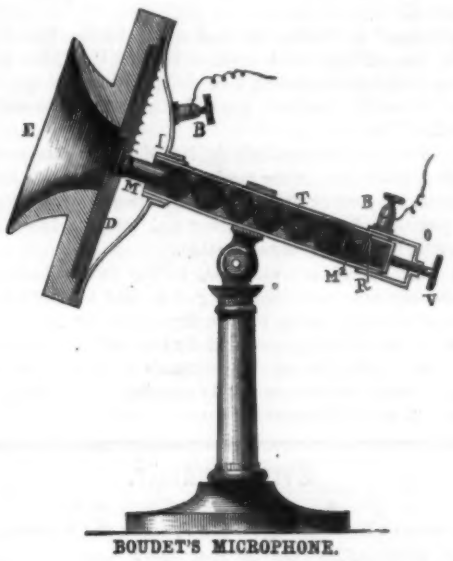


MULTICOLOR PRINTING PRESS.

NEW MICROPHONE.

BY M. BOUDET, OF PARIS.

This microphone, with multiple contacts, as shown in the accompanying figure, is composed of a mouthpiece, E,



BOUDET'S MICROPHONE.

affixed to the end of a glass tube, T, one centimeter in diameter, itself fixed on a jointed stand, thus enabling the whole apparatus to be moved at any inclination.

The mouthpiece contains an ebony plate one millimeter thick, on which is fixed a piece of copper, M^1, penetrating the glass tube a slight distance. In this tube there are six carbon balls slightly smaller in diameter, so that they can easily be moved.

The microphone is completed by a second piece of copper, M^2, supported on the end of a hollow breach, K, by means of a little spiral spring, not shown in the figure. The screw, V, fixed in the cup, Q, serves to regulate the pressure of the piece, M^2, against the balls. The variations in the resistance of the microphone are reproduced equally through all the contacts of the balls, because, when talking at the mouthpiece, the vibrations are transmitted almost instantaneously, as in the well known case of billiard balls.

The apparatus acts like an ordinary middle-sized Gaiffe microphone, with six elements (peroxide of manganese and chloride of zinc) set up with a resistance of 800 ohms, with a Bell telephone for receiver.

By employing inductive currents and a fine wire telephone receiver—a necessity with inductive currents—the distance may be largely increased, and extended, with artificial resistances, to 250,000 ohms.

We have been present at experiments made with this microphone, and we have found that it transmits the voice very clearly, without altering the tone and without any scratching sounds.—*Electrician.*

RECENT INVENTIONS.

A suspension clothes line pulley has been patented by Messrs. David H. Payne and Jerome H. Payne, of Troy, N. Y. The pulley is formed of a central disk, projecting arms, and rings, joined to the arms, the line running in the groove or throat formed by the arms and rings. The pulley turns horizontally on a vertical axis, and the lower ring has rollers placed on it, which prevent the entanglement of the clothes with the pulley when the line passes over it.

Mr. August Berghaus, of Brugge, Prussia, Germany, has patented a handle attachment for agricultural implements, which is simple and effective. A spring socket attached to the implement is arranged to receive the end of the handle, which is held therein by a conical ring or sleeve drawn over the ends of the spring socket. The handle is by this means quickly and firmly clamped in the socket.

Mr. James E. Tyler, of Orange Court House, Va., has patented a machine for edging sheet metal, which forms either a single or double lock upon the edges of the plates that may be hooked or pressed together to form a secure joint either for sheet metal articles or for roofing. A pair of griping jaws, one of which is provided with a lip, seize the edge of the metal and bring it under a presser bar to form a single fold or lock, and the machine is further supplied with a pivoted bending jaw that may be forced around the griping jaws to form a double fold.

Mr. William G. Lindsay, of Winneconne, Wis., has invented a stovepipe damper of that variety made in two circular parts separated by a narrow space and secured to the same turning rod. The pieces are made with lugs having square holes, and the turning rod is square to fit these holes. One plate is of greater diameter than the other, and has an opening in its center. By this construction the passage of the smoke or gases of combustion is obstructed, but never wholly prevented.

Mr. John Herrmann, of Columbus, O., has patented a window cornice which may be adjusted to windows of different widths. The adjustment is made under the center piece, and is therefore concealed. It is accomplished by a tongue and groove device with suitable means for fastening the adjustable pieces in adjustment.

Mr. Ila M. Moore, of Battle Creek, Mich.

has patented an improvement in knitting machines whereby a double web, with two threads, is formed in such manner that, if the threads be of different colors, the finished fabric will be striped lengthwise.

Mr. Patrick Deevy, of Melrose, Iowa, has patented an improved guard finger and sickle bar. The sickle bar is sectional, each section carrying a cutter as a part of it. These parts are made interchangeable, and by tongue and groove devices may be put together and fastened by screws to form one rigid bar. Each finger or guard is made in two parts, mortised and tenoned together at one end, and in the under part or section is a mortise in which is fixed a cutting blade that can readily be removed for sharpening and replaced securely without the aid of screw or bolt.

DECISIONS RELATING TO PATENTS.

United States Circuit Court—Northern District of Illinois.

RESWEATING OF TOBACCO.—ROBINSON *et al. vs.* SUTTER *et al.*

Blodgett, J.:

This is a suit for infringement of letters patent granted by the United States to complainant, Abraham Robinson, on the 10th day of June, 1879, for an improved apparatus for resweating tobacco.

The defense set up is, first, that defendants do not infringe complainants' patent; second, that complainants' patent is void for want of novelty.

It seems from the proof that in the manipulation of tobacco it is deemed very desirable to obtain a dark uniform color in the leaf, especially of that to be used for cigar wrappers; that in the natural sweating which the leaf undergoes in the ordinary process of curing it is left spotted, or some leaves will be darker than others, and the process of resweating is intended to bring the tobacco to a dark and uniform color.

Robinson claims to have discovered that tobacco can be successfully resweated by packing the leaves closely in a mass in a wooden box or tub made substantially tight, except so far as the pores of the wood will admit vapor or moisture to slowly percolate through the wood and diffuse itself with the mass of leaf from a body of warm water and expanded steam contained in an outer tank or chamber surrounding the tobacco holder, the process to continue from three to eight days according to the mass of tobacco to be operated upon. The apparatus which he devised for this purpose, and which is covered by his patent, consists: First, of a tank or chamber adapted to hold a body of water and sufficiently tight to hold expanded steam, or steam generated or let into the chamber at a very low pressure. The model presented here consists of a tank which is water-tight at the bottom and substantially water or steam tight above, with the tobacco holder let into it and suspended by a rim upon the edge, the holder being made tight, as described; but the patentee does not restrict himself to this precise form of construction. Second, a tobacco holder in which this mass of leaf tobacco is placed, which tobacco holder is placed or suspended inside of the tank or chamber. Third, a steam generator for producing steam, by which the water in the chamber is to be warmed and steam generated, whereby a warm humid atmosphere is kept constantly about the tobacco holder, and the warm moisture gradually diffused through the tobacco in the holder.

The device used by defendants operates upon precisely the same principle as that of complainants—that is, it has a tank or chamber within which the tobacco holder is placed. The bottom of the tank is supplied with water which is heated by an outside steam generator or heater; and the only difference between the two devices of the complainants and the defendants is that the defendants' tobacco holder is not made tight, so as to exclude moisture except through the pores of the wood, the defendants, in practice, using the ordinary tobacco cases in which leaf tobacco comes packed to hold the tobacco during their process of resweating. In other words, the defendants open the doors in their tank and slide the ordinary tobacco case full of tobacco into this steam box, and allow it to remain there until the tobacco has become resweated, which is in no respect different from the process of Robinson, except as hereafter noted; but it is claimed that this is a substantial difference, because it is insisted that complainants' claim requires their tobacco holder to be tight, while the defendants' tobacco holders are not tight. I think, however, the word "tight," as used in his claim, is to be construed, in the light of his specifications, as meaning sufficiently tight to subserve the purposes to be accomplished. The term as used here must be held, I think, to mean comparatively or approximately tight—close enough to exclude an excess of steam or moisture, and open or porous enough to allow the warm moisture to sweat or percolate into the tobacco holder, so as to warm and moisten its contents; and it would seem that slight crevices or openings arising from defective mechanical construction, if not large enough to admit steam in such quantity or volume as to wet the tobacco, would not violate this patentee's rule of construction.

1. The word "tight," used in the claim to qualify the wooden tobacco holding vessel, *Held* to mean sufficiently tight to subserve the purposes to be accomplished by the invention.

2. Crevices or openings in the wooden tobacco holder arising from defective mechanical construction, if not large enough to defeat the operation of the device, will not relieve the apparatus from the charge of infringement.

3. The patent shows an organized apparatus consisting of a steam and water containing chamber and a wooden tobacco holder specially constructed for that purpose suspended in said chamber. The defendants employ the steam and water containing chamber, but, instead of using a wooden tobacco holder specially made for that purpose, use for containing the tobacco in the chamber the ordinary wooden tobacco case in which leaf tobacco comes packed; *Held* to be an infringement.

United States Circuit Court.—District of New Jersey.

HARVESTER PATENT.—TYLER *et al. vs.* CRANE.

Nixon, J.:

1. In a suit for infringement of reissued letters patent No. 6,609, granted August 24, 1875, to Samuel W. Tyler, for an improvement in harvesters, two defenses were set up; first, want of novelty; second, the defendant's machine did not infringe.

2. *Held* that the patentee's device of placing the gearing and shafts that impart the motion to the cutters upon a rigid common support or frame formed in one piece, to correct the practical defects of twisting and warping in existing two-wheel machines, is sustainable.

3. That defendant's machine, having two wheels with connecting axle, and containing the solid piece or frame made of a single casting for the support of the intermediate draught and gearing sustained by the axle, differing only from the mechanism of the patentee's in having the solid piece directly and not mediately attached to the axle of the wheels, is an infringement.

Correspondence.

Captain Eads' Ship Railway over the Isthmus.

To the Editor of the Scientific American:

Referring to your issue of November 13, 1880, I suggest an improvement which I think might be made in the car of Capt. Eads for his projected ship railway, which you illustrate.

As illustrated the principal weight of the ship is on the keel, which rests rigidly on the car, while the bilge is supported by solid and unyielding blocks.

Now, to accomplish this without severe strain to the ship while in transit, the car or cradle must be perfectly rigid, while all elasticity must be in springs over the wheels.

It would seem that in order to construct a car four or five hundred feet long, which would be rigid enough not to bend and thus cause the ship to be unevenly supported while passing over any curve in grade or uneven place in the roadbed from whatever cause, would require a very great additional weight of metal, more than would be required were the keel rests and bilge blocks made to rest on air cylinders, all of which should be connected by hose or some other flexible connection by which compressed air could pass from one to another. Thus, regardless of the bending or twisting of the car, either longitudinally or otherwise, the ship would at all times have a perfectly even and elastic support, which would not in any case bring an unequal bearing or strain on the vessel in transit or wheels of the car, as when any bearings would be relieved by curve in grade or depression in track the compressed air from others would be forced through the connections, thus making every bearing do its exact portion of duty and allowing none to be overloaded or any unequal strain to the ship. This would avoid the necessity of any tilting tables, as the grade could be changed by a gentle curve.

The body of a cradle or car of this kind should be as light and flexible as strength and perfect safety would permit.

Another advantage of this system would be that in handling a large ship, instead of requiring another and longer car than for a smaller one, it would only be necessary to attach a section to make it the required length, and connect the air tubes as is done with air brakes on ordinary railroads. This in order to secure equal pressure in the cylinders of both sections.

My method of constructing such compressed air springs would be to build in the center of the cradle cylinders large and numerous enough to support the proper proportion of a ship's weight.

To support the balance of the burden, each bilge block should contain an air cylinder, and all cylinders should be connected as above stated. By arranging in this way with air-tight pistons to support the plates on which the ship would rest, a lighter car could be used with better result, and the bilge blocks might be moved into place as easily as if solid. Some such principle applied to the cradle would allow a more cheaply constructed roadbed than would be possible with a rigid car, and the ship would be relieved of any injurious strain in transit. WALTER B. GUILD.

New York, January, 1881.

[NOTE.—Capt. Eads appears to be fully alive to the value of the points above mentioned. One of the patents taken by Capt. Eads is for a hydraulic cradle to carry the ship, in which the vessel is supported on hydraulic jacks, all connected, as our correspondent suggests.—EDS. S. A.]

The Flywheel Explosion.

To the Editor of the Scientific American:

Please allow me to make a few comments upon Mr. Rose's article on "A Mysterious Explosion," on page 38 of your paper. He says: "If the flywheel broke first, it should have left the spindle all right running in its bearings." This is true, if all the fragments separated simultaneously; but—considering that every ounce of the rim of a 30-inch wheel at 2,000 revolutions per minute has a centrifugal force of about 100 pounds—suppose any considerable portion of one side to have gone first, would not the remaining unbalanced part have wrenched the spindle from its bearings in a twinkling?

Of the holes drilled in the rim of the wheel, Mr. Rose says "their number and size (as shown in Fig. 10) preclude the idea that they could have been made to balance the wheel, especially as it appears a well shaped casting," etc. There may be a difference of opinion on that point. What is the alternative? As near as I can judge by measurement of the figure, the weight removed by boring these holes would be not far from three-quarters of a pound. If, then, being a "good casting," the wheel was in balance without the holes, it would with them be out about 12 ounces on a radius of 14 inches. Is it at all probable, I may say, even possible, that it was used in that condition, at the velocity named? O. A. BENTON.

Amenia, N. Y., January 18, 1881.

Soldering Cast Iron.

To the Editor of the Scientific American:

A few weeks ago, being in a manufactory where hardware of all sorts is made for harness, I was told that pieces of cast iron could not be soldered together; and that if any inventor could devise a process by which cast iron *could* be soldered, he could not fail to disclose a process that would be of untold value, especially to manufacturers of harness hardware. As I have been accustomed, for many years past, to solder together pieces of cast iron, always with most satisfactory results, it occurred to me that perhaps the little experience which I have had may help some mechanics out of a little difficulty.

Many years ago the cistern pump of a neighbor was allowed to freeze up when partially filled with water, the result of which was the cylinder was bursted for about six inches in length. The part of the cylinder at the crack was placed on the grindstone, and ground away until the iron was clean and bright for an inch or more on both sides of the crack. Then the cylinder was put in a vise and screwed up tightly, and held in the vise while solder was applied along the crack. The first process was to "tin" the surface of the cast iron, so that the solder would take a strong hold of the iron. Muriatic acid was applied with a swab to the bright iron, after which a little of the best kind of solder was laid on and rubbed rapidly over the surface, with the soldering iron as hot as it could be without burning the tin off the copper soldering iron. After the cast iron had been well tinned solder was applied, and piled on over the crack until it was at least one-eighth of an inch thick all over the crack. That soldering never failed so long as the pump was in use.

Last year a cast iron wheel on our portable forge was broken, by an accident, into so many pieces that it was judged to be impracticable to mend it. As no one could determine where such forges were manufactured we could not procure a new wheel. To make a new pattern for another wheel like the broken one, pay for casting and fitting up, would cost several dollars; so I concluded to solder the parts together. Several machinists laughed me in the face for suggesting such a manner of repairing that wheel. But I took all the parts, and went where I could have the use of an emery wheel, and the surface of the iron on both sides of the cracks or breaks was neatly polished for at least half an inch to an inch from the break. Some of the arms were broken in two pieces. There were eight arms. Some of the arms tore away a piece of the rim. In some pieces it was not practicable to touch the surface with an emery wheel or file. The only way of removing the hard scale and rust from such places was with a sharp cold chisel. All the polished surfaces were first *tinned* in a thorough manner, after which the arms were put in their respective places, and the parts neatly and thoroughly soldered all over the breaks. The job cost about fifty cents' worth of time, and ten cents for the solder. The wheel runs as true as it did before it was broken, and to all appearance every part is as strong as ever. Indeed, we all judge that the parts would break in the solid iron sooner than where the arms and rim are soldered. There will be no difficulty in soldering cast iron if the surface is first polished and then well *tinned* with a hot soldering iron.

I always keep several small bottles containing muriatic acid of different degrees of strength. One bottle has in it pure acid. Another contains about three parts of acid and one part water. Another bottle contains about three parts acid and one part water, in which we have dropped numerous small pieces of sheet zinc. The acid will dissolve the zinc in a few hours. The acid in this last bottle is employed when soldering tin. The acid will corrode and clean the surface so that melted solder will unite with the clean and rough particles of iron, taking such a firm hold that one can scarcely perceive where the iron ends or where the solder begins. Wrought iron and steel also may be soldered with less difficulty than cast iron, if the surface is first polished and afterward tinned with good solder. If the surface is not tinned *thoroughly* the solder will not adhere with satisfactory tenacity to the iron. The reason why it is so easy for any one to solder tin consists in the fact that a sheet of tin is simply thin iron well covered with tin. After the surface of any piece of metal has been *tinned* any tinker can make melted solder adhere to the surface. S. E. T.

Orange, N. J.

THE OBELISK IN CENTRAL PARK.

The venerable monument, late of Alexandria, Egypt, and popularly miscalled Cleopatra's Needle, has been successfully transplanted to Central Park.

From time to time, from the first inception of the enterprise which has brought to our shores one of the most famous legacies of ancient civilization, down to the landing of the obelisk at the foot of West 96th street, last fall, the successive stages of the great undertaking have been described in this paper. With the completion of the work a brief review of the chief facts in the history of the obelisk and its voyage hither may properly be given before taking up the final chapter.

The material of the monolith, a reddish granite (syenite), shows that the stone must have come, as Egyptologists declare, from the ancient quarries of Syene, now Assouan, near the northern boundary of Nubia. From this point it was probably floated, as Pliny says all the obelisks were, on huge rafts or flat-bottomed boats to the sacred city of On, known to the later Greeks as the City of the Sun, or Heliopolis, a distance of about 450 miles. At Heliopolis, which was situated about eight miles from the site of the modern city of Cairo, our obelisk with its companion shaft now in London was set up before the entrance of the Temple of the Sun. Doubtless its position there was substantially like that of the remaining obelisk before the ruined Temple of Luxor, as shown in Fig. 1. The fallen mate of the Luxor obelisk was removed, it will be remembered, to the Place de la Concorde, in Paris, where it now stands.

The first erection of our obelisk at Heliopolis took place not less than 3,500 years ago, the precise date being fixed by some students of Egyptian history at B.C. 1640. Others give an earlier date as probable. It is certain, from the central columns of inscriptions on the stone, that the obelisk dates from the reign of Tothmes III., who ruled over Egypt when the Empire was at the height of its power and glory, and covered not only Northern Africa as far as Abyssinia, but Western Asia as far as Kurdistan and Armenia, south of the Caspian Sea, and all of Arabia.

For more than 1,600 years our obelisk stood at Heliopolis, and saw the glory depart from upper Egypt. It was then transferred to the newer seat of power and commerce, ancient Alexandria, 120 miles down the Nile, to adorn a majestic temple, probably begun by the great queen Cleopatra, but not completed until some years after her death. The fragmentary inscriptions on the copper crabs on which the obelisk rested at Alexandria make it certain that its erection there occurred during the eighth year of the reign of Augustus Cæsar, or B.C. 22.

While standing at Heliopolis, says Consul-General Farman, in one of his communications to the State Department, "it had passed the whole of the golden period of ancient Egyptian history. It had in all probability looked down upon the boy Moses as with the noble youths of the land he daily went to receive instruction from the priests of the Temple of the Sun, and also beheld on his part with admiration the then golden hieroglyphs that so long puzzled the wise men of modern times, but which he read as a student reads his Latin. It had beheld the chosen people of God in the days of their oppression and witnessed their exodus and the excitement that resulted therefrom, the hurrying to and fro of the priests of the temple, and the groups of people in the public places of the city discussing the great event. It had afterward watched the passing generations during the reigns of the Pharaohs for eight centuries, and had not only actually looked down upon those monarchs, but also upon all the long line of scholars who came to seek knowledge in this famous city of learning. It had then witnessed the conquests of the Persians, and mutely seen the City of On and its temples and many of its companion obelisks destroyed by the sacrilegious soldiers of Cambyses; and afterwards in a period of tranquillity it had seen Plato in his daily walks while sojourning in that city pursuing the study of philosophy and astronomy. Still later, amid the surrounding ruin and desolation, but ever looking further out upon the green fields of the valley of the Nile, it had seen the coming of Alexander the Great and his warm reception by the people as their deliverer from the yoke of the Persians, and afterward witnessed the three hundred years' reign of the Ptolemies, and finally, at the coming of the Cæsars, it had left the decay and ruin of its inland town and been transferred to the busy seaport of Alexandria. Here it has stood upon the seashore, a beacon for the mariners, for nineteen hundred years, and watched the rolling waves and the coming and going of the ships on the one side and the kaleidoscope of human events on the other.

Rebellions and insurrections, invasions and conquests, the struggles between Paganism and Christianity, between Christianity and Mohammedanism, between the different dynasties of the Arabs and the Turks, the successive rules of Sultans, Caliphs, and Mamelukes, and finally the conquest of Napoleon and the battles between the English and French on the waters and soil of Egypt, have all since its removal been witnessed by this sole surviving monument of the ancient City of Alexandria."

During the later ages of its sojourn in the modern city of Alexandria, the obelisk stood, as shown in Fig. 2, in a neglected quarter, its foundation, its unsuspected pedestal, and nine feet of its shaft buried in sand and rubbish, at last bereft even of its fallen companion, which had long lain half buried in sand.

The history of the removal of the obelisk from Alexandria to New York will doubtless be told at length by Lieutenant-Commander H. H. Gorringe, U. S. N., under whose direction its last migration has been brought to successful conclusion. The more salient facts of the history can be summed up in few words.

A little more than three years ago Mr. John Dixon, the engineer employed to convey the original and fallen companion of our obelisk to London, informed the *World* through Mr. Louis Sterne, an American engineer, that Ismail Pasha, then Khedive of Egypt, desired to present the remaining obelisk to the United States. The coöperation of Mr. Henry G. Stebbins, then a member of the Park Commission of New York, was enlisted by the editor of the *World*, and the possibility of securing the obelisk for our city was publicly announced. Within a few days a wealthy citizen of the city (understood to be Mr. Wm. H. Vanderbilt) agreed to defray the estimated expense of taking down the obelisk and bringing it to New York. The matter was thereupon laid before the State Department at Washington, and Mr. Farman, United States Consul-General in Egypt, was directed to take the necessary steps for the official transference of the obelisk from Egyptian to American ownership. French and English influence, then dominant in Alexandria, were strongly arrayed against the fulfillment of the Khedive's offer. About this time the Khedive was compelled to abdicate. Consul-General Farman at once obtained a written confirmation of the gift at the hands of Mohammed Tewfik Pasha, the son and successor of Ismail Pasha, the writing bearing date May 18, 1879.

Meantime Mr. Dixon's unfortunate experience in the transportation of the London obelisk led him to decline the more serious undertaking of lowering and transporting across the Atlantic the companion of the stone he had had such bad luck with. At this juncture Lieutenant-Commander Gorringe returned from a surveying cruise in the Mediterranean in command of the U. S. steamer Gettysburgh. He had made a study of the standing obelisk at Alexandria with reference to the conditions of its possible removal, and now submitted to the Secretary of State a proposition to undertake the task. His plans were approved; and having seen to the construction (at the Phœnix Iron Works, at Trenton, N. J.) of the machinery he had devised for taking down and shipping the monolith, he sailed for Alexandria by way of Liverpool, August 24. The completed machinery followed some weeks after. The ensuing winter and spring were spent by Commander Gorringe in the double task of overcoming the material difficulties and the more annoying political difficulties attending the lowering of the obelisk, its removal to the water, and its stowage in a vessel, the steamer Dessoug, which he had purchased for its conveyance to New York. The magnitude of the task will be appreciated when account is taken of the enormous size and weight of the stone. The obelisk proper is 69 ft. 2 in. long, 7 feet 7 inches by 8 feet 2 inches at the base, tapering to about 5 feet square at the foot of the pyramidion. The weight of the stone is 196½ tons. The pedestal is 9 feet square, 7 feet high, and weighs 43 tons. The weight of the other stones of the foundation is given at 87 tons. The summit of the obelisk was something over 81 feet above the lower step of the marble platform which formed the base of the monument.

A description of the engineering operations at Alexandria, as given by Lieutenant-Commander Gorringe before a recent meeting of the New York branch of the United States Naval Institute, was printed two weeks ago in the SCIENTIFIC AMERICAN of January 22.

The Dessoug sailed with her precious cargo June 12, 1880, and arrived at Gibraltar ten days later. The voyage from Gibraltar to New York occupied nearly a month, owing to a delay caused by a broken crank shaft. After her arrival, July 20, the Dessoug lay at anchor in North River for some weeks while the final disposition of the obelisk was under discussion. She was then taken to Clifton, Staten Island, hauled out of the water on the marine railway there, and opened at the bow for the discharge of the stone, which was run out on a massive platform supported by two rows of piles in such a way that the stone could be floated off on pontoons at high tide. A proper conjunction of weather and tide did not occur until September 22, when the stone was floated to the pier provided for it at the foot of West 96th street.

The method of disembarking the obelisk is shown in Fig. 3. Owing to the necessary narrowness of the opening in the bow of the Dessoug, the means by which the stone was to be moved had to combine the greatest strength with the least bulk. There was but 8 inches to spare, and the usual device for handling such heavy bodies would require at least four times that space. Accordingly, Commander Gorringe adopted a sort of railway formed of 6-inch channel iron and 5¼ inch cannon balls, one set of channel irons forming a trough for the cannon balls, the other set (inverted) riding above and carrying the stone. This device, Commander Gorringe is careful to state, was not original with himself, as has been reported. It was first employed, so far as he can discover, in the handling of the gigantic bowlder on which stands the statue of Peter the Great in St. Petersburg.

The same machinery was utilized in moving the obelisk across the tracks of the Hudson River Railroad at 96th street, as represented in Fig. 4. After that the plan of the ordinary marine railway was employed, as shown in Fig. 5, the movable track being carried forward as fast as the stone progressed. From the river the course of the stone was up 96th street to the Boulevard; thence to 86th street, through the transverse road to 5th avenue, and down to 81st street, from which point an incline of massive trestle work, 920 feet long and rising three-quarters of an inch to the foot, led to the site of the final resting place of the obelisk. The power required in hauling the stone up the stiff grade of 96th street was equal to a dead pull of 36 tons; on the incline the power required was 24 tons.

Meantime the foundation stones and the pedestal had been put in place and the towers or gallows frame erected for sustaining the obelisk during the last critical stage of the work. The towers were the same as were used in taking down the obelisk at Alexandria. The steel work of each tower was of six 12-inch heavy I-beams, spreading out at the base to a distance of 21 feet, and converging at the top to less than 5 feet. At their base the beams rested on four heavy I-beams, and were securely riveted to the platform by means of plates and knees. On top of the towers were caps 5 feet long and 30 inches wide, secured by plates and knees. The towers were braced from top to bottom by angles and channel irons, making them perfectly rigid. Placed on top of the caps and securely bolted to the towers were pillow-blocks weighing 3,700 pounds, and forming the bearings for the trunnions to turn in. The trunnions on which the obelisk turned while being swung into upright position were each 33 inches long and 18 inches in diameter, and were cast of the best quality of cannon metal. The trunnion plates, each 4 inches thick, 9 feet wide, and 6 feet high, were securely held in position, just above the center of gravity of the shaft, by strong connecting bolts. The two trunnions with their plates weighed 6 tons. The entire weight of metal employed in handling the stone was something like 60 tons.

As the monolith stood at Alexandria it was supported by copper crabs at the base, which left room for passing under it heel straps to be connected with the trunnion plates to prevent their slipping when the obelisk was lifted. In Central Park the stone rests squarely upon its base, the heel of the shaft, which was originally rounded, having been cut square off. This made it necessary to provide a substitute for the heel straps. For this purpose two massive friction plates of gun metal were cast at the Brooklyn Navy Yard to snugly fit the base of the stone, the hold being secured by pressure, by the penetration of the metal into the hieroglyphic incisions, and by overlapping the corners which had been cut away for the crabs. These base plates were strongly bolted together and connected with the trunnion plates with steel rods tightened by means of turn-buckles.

The copper crabs alluded to were originally four in number, but two of them had been stolen at some time, probably for their metal. The place of one had been supplied by a block of stone, wedged in with iron; the other corner was vacant. The bodies of the remaining crabs, which were genuinely crab-like in form, were about 8 inches thick, 12 inches long, and 16 inches broad, and weighed about 150 pounds each. They were much broken in lifting and turning the obelisk, and were replaced by other crabs of bronze made at the Brooklyn Navy Yard. Unlike the original, these do not bear the weight of the obelisk, which rests directly on the stone of the pedestal, but simply fill up and ornament the cut-way corners.

With the trunnions in exact line with their bearings as in Fig. 7, the ponderous stone was lifted by means of six powerful hydraulic jacks; the cradle was removed, and then the obelisk was slowly lowered by the jacks until its weight rested on the trunnions. Here, poised on its center of gravity between the towers, it awaited the final turn at noon Saturday January 22.

Not the least remarkable feature in the history of this unprecedented transportation of a great historical monument over a hundred degrees of longitude and across a great ocean, is the uniform success, celerity, and good fortune which attended every stage of the undertaking, a good fortune mainly due, all must admit, to the scientific and diplomatic skill of Lieut. Commander Gorringe. The practical wisdom of his prearranged plan of conducting the enterprise was justified by the fact that it was carried out without a single material alteration of mechanical or engineering detail, save that made necessary by the unexpected popular opposition stirred up by foreign influence in Alexandria against the carriage of the obelisk the nearest way to the ship through the streets of the city.

For our views of the several stages of the progress of the obelisk we are indebted chiefly to Messrs. Harroun and Bierstadt's admirable series of artotype views of the obelisk.

Erratum.

In article on "Expansion of Steam," by Prof. Thurston, January 8, 1881, for $\frac{P \times 37}{29}$ (Emery's formula) read $\frac{P + 37}{29}$

WE are informed that many of our leading manufacturers who have heretofore been troubled with the formation of scale in boilers are now using the Eureka vegetable boiler scale eradicator with very satisfactory results. G. E. Brinckerhoff, 107 Liberty street, New York, is agent for this article.

A Large Gold Brick.

Recently there was cast in San Francisco a brick of gold measuring 12¾ inches in length, 7 inches in breadth, and 4½ inches in thickness. It was 950 fine, weighed 3,785·17 ounces troy, and was valued at $76,000. It represented one month's product of the Spring Valley Hydraulic Mine, and was said to be the largest gold brick ever cast in California.

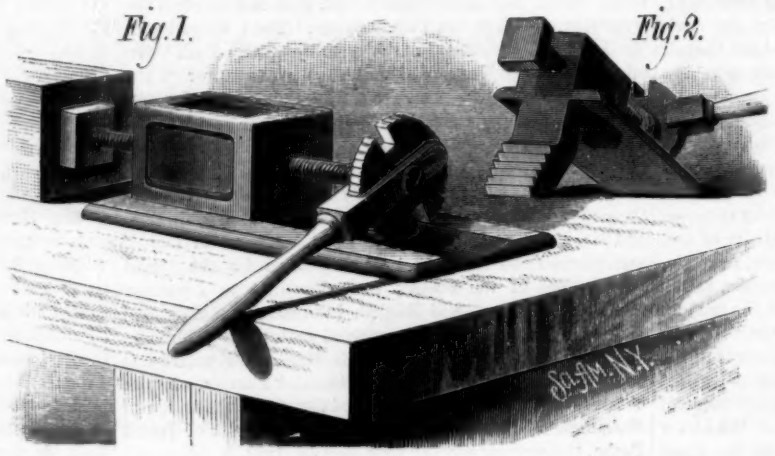
IMPROVED BENCH CLAMP.

The bench clamp shown in the annexed engraving is designed for the use of carpenters, sash, door, and cabinet makers, and is to be attached to the ordinary bench by means of a downwardly projecting foot which enters one of the several sockets formed in the bench top. The upper surface of the foot is inclined and serrated, as shown in Fig. 2. The general arrangement of the clamp is shown in the perspective view, Fig. 1. The nut formed on the base plate receives a screw having at one end a follower which presses the work, and at the other end a ratchet wheel whose teeth are engaged by a projection formed on the ratchet lever, which swings on the head of the screw and has sufficient longitudinal motion to permit of bringing it into engagement with the teeth of the wheel or of inserting it into the deeper notches formed in diametrically opposite sides.

The clamp may be placed in any desired position on the bench, and may be brought to bear upon the side or end of work whose opposite side or end is supported by the ordinary bench pin.

This device can be applied to great advantage in both wood working and iron work, and it will be found useful in marble and stone cutting. It replaces the cumbersome clamps in common use, and may be applied to a number of purposes which we need not enumerate. This invention was recently patented by Mr. James Murphy, of San Antonio, Tex.

Fig. 1. *Fig. 2.*



MURPHY'S BENCH CLAMP.

IMPROVED EXTENSION TABLE.

We give herewith an engraving of an improved extension table, in which the extending sections are contained in the table and are automatically placed when the table is pulled out or extended.

Fig. 1 is a perspective view of the table showing one half closed while the other half is being extended. Fig. 2 is a perspective view of the under side, showing the mechanism which sustains and operates the extension sections. Lazytongs connect the legs at the ends of the table with the legs in the middle, and the extension sections, which drop and are covered by the other sections as the table is closed, are raised into their places by the lazytongs at the instant the table top is drawn out sufficiently to admit of it. The lower terminals of the lazytongs slide in slotted plates, D, attached to the legs, and when near the upper portion of the slot they strike brackets which support the movable end sections of each half of the table top. The permanent sections of the table top, that is, the sections which always lie in the same horizontal plane, alternate with the vertically movable sections, and are attached to and supported by alternate sections or links of the tongs.

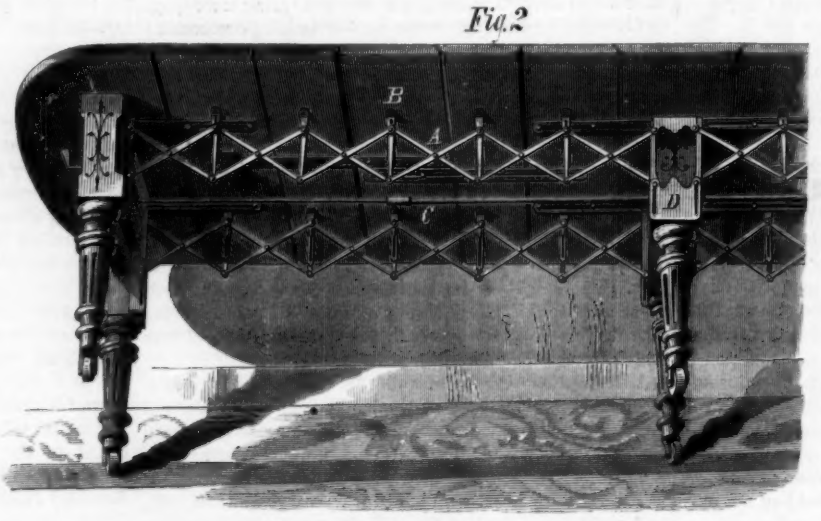
The extending sections are mounted on uprights, B, which extend downward and are slotted to receive the pivot of the upper joint of the lazytongs sections; these uprights are also connected by a sliding connection with the lower joint of the section. The parts are arranged so that the movable sections always maintain a central position in relation to the permanent ones; and when the permanent sections are sufficiently separated, the rising of the lower joint then carries the intermediate movable sections upward into place and sustains them in that position.

The table is locked in an extended or closed position by pressing a button. A lady or child may readily open and close the table, so small is the force required, as the pivoted trusses, C, are balanced and the table works almost as easily as a door turns on its hinges. The table top, whether drawn out or closed, is always supported by trusses, which give it great strength and rigidity, and there is no doubt of the superiority of the table in point of durability. It is a most desirable improvement.

The advantages of a table of this construction will be apparent to any one having had even a slight experience with extension tables of the common form. The extra leaves are always in place and properly stored, and all that is required to lengthen the table is to release the retaining rod and draw it out, and to shorten it when lengthened is simply the reverse of this operation. This useful invention was recently patented in this and several foreign countries by Mr. J. D. Brassington, 256 West 28th street, New York city.

The patentee will be pleased to correspond with parties wishing to purchase the patent, or to obtain license to work the invention in the United States, Great Britain, or Canada.

Fig. 2



BRASSINGTON'S EXTENSION TABLE.

NEW INVENTIONS.

An improvement in tool handles, patented by Mr. John Gearon, of Beloit, Iowa, provides a new method of attaching handles to axes, adzes, hammers, etc. Instead of the usual eye for receiving the handle the tool has dovetail recesses on opposite sides, into which metal bars are inserted, which are concave on their interior surfaces below the tool for the reception of the handle, and are also provided with a recess for the reception of shoulders on the handles. The exterior of the lower part of the bars is screw threaded for ring nuts, which clamp the bars upon the handle, forming a secure attachment.

Mr. Aaron M. Sidwell, of Girard, Kansas, has patented a transplanter so constructed that plants can be readily removed from the ground without disturbing the soil around their roots, and holes made in the ground of exactly the shape and size of the soil raised with the plants. A very convenient implement.

Mr. Emil Schubardt, of New York city, has patented a jacking wheel for vehicles, which can be applied in case a loaded truck or other vehicle breaks a wheel or axle. By means of clamps and braces this wheel, which is small, can be readily applied, and by a screw the vehicle can be jacked up for immediate removal. The device is portable.

Mr. Edward N. Oualline, of Hockley, Texas, has patented an improved wheel hub, which permits the taking out of a broken spoke and the insertion of a new one without the removal of the wheel tire. The hub is sectional, and provided with spoke sockets having open sides, which are closed by a plate held by bolts which pass between the spokes.

An improved copybook, patented by Mr. Elmer P. Newton, of Dimondale, Mich., is claimed to be more convenient in use and less expensive than those heretofore used. The copies are printed in rows on a few pages of the book, the rows being easily separated by perforated lines. Each copy may be torn off, and by means of a copy holder attached to any of the pages where required. A saving in the cost of printing is thus effected.

Mr. George Blair, of Prescott, Ontario, Canada, has patented an improvement in stovepipe collars. It is formed by curving laterally a ribbon of metal into a circular form, at the same time forming therein radial corrugations or flutes which are deepest near the interior border of the collar. This collar will fit stovepipes of different sizes, and of course will allow expansion or contraction. The whole is made integral by joining the ends of the ribbon by a tongue and slot joint.

Mr. John D. Sanders, of Lone Oak, Texas, has patented an open link for connecting trace chains to whiffletrees and other purposes, so constructed that it can readily be attached or detached without the use of tools, is fastened automatically when closed, and is not liable to become accidentally detached.

Mr. Laurids J. M. Mortenson has patented a wagon hound brace holder or post, by which the hounds and circle are firmly held together, and by use of which the brace, instead of being weakened, as it is by some forms of brace holders, is strengthened.

A bottle filler, patented by Mr. Emile Kleiber, of New Orleans, La., supplies a machine for filling bottles with viscid oils and other viscid liquids, by which the oil or other liquid is forced out by air pressure, and the cocks are opened by the rise of the bottles to be filled. The arrangement is very ingenious, and will greatly facilitate the bottling of this class of liquids.

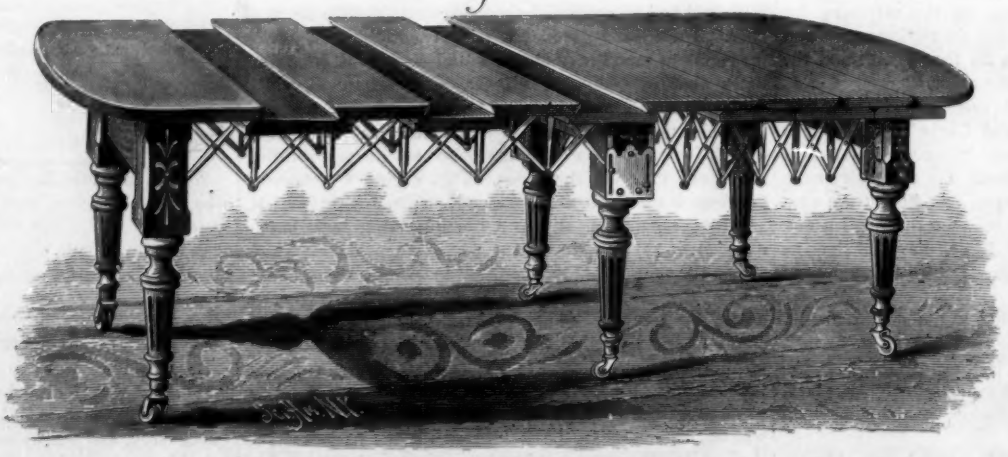
Mr. Alexander C. Bell, of New Alexandria, Pa., has patented an improved cider mill and wine press. The fruit is first placed in a hopper and ground. It is then passed between compression rollers to extract the juice, and the pomace is then dropped on an endless belt, which carries it out of the mill. The compression rollers are covered with rubber. These rollers compact together so closely as to prevent the passage of the juice between them, while their elastic quality permits the pomace to pass. The juice flows from their upper surfaces as from a trough, and is received into a conductor, through which it flows out of the mill.

Mr. Charles W. Millspaugh, of Rowaton, Conn., has patented an improved music holder. It is a horizontal bar provided with two sliding blocks, carrying clamping springs which press upon the leaves on each side of a music book.

An indicator, designed more especially for attachment to boxes or drawers which contain boots and shoes, but which may be employed for other purposes, has been patented by Mr. C. Friedrich A. Bultmann, of Sumter, S. C. It not only indicates the kind of merchandise contained in the drawer or box, but also the number of articles.

A band cutter for thrashing machines, patented by Messrs. John Alexander and William Alexander, of Hazelrigg, Ind., is so constructed as to cut the bands as the bundles are fed to the band table, and to present the grain to the feeder in better condition than when the bands are cut by hand, economizing labor, and preventing all danger of the feeder's hands being cut by the band cutter. The construction of the device is simple, and its action effective.

Fig. 1



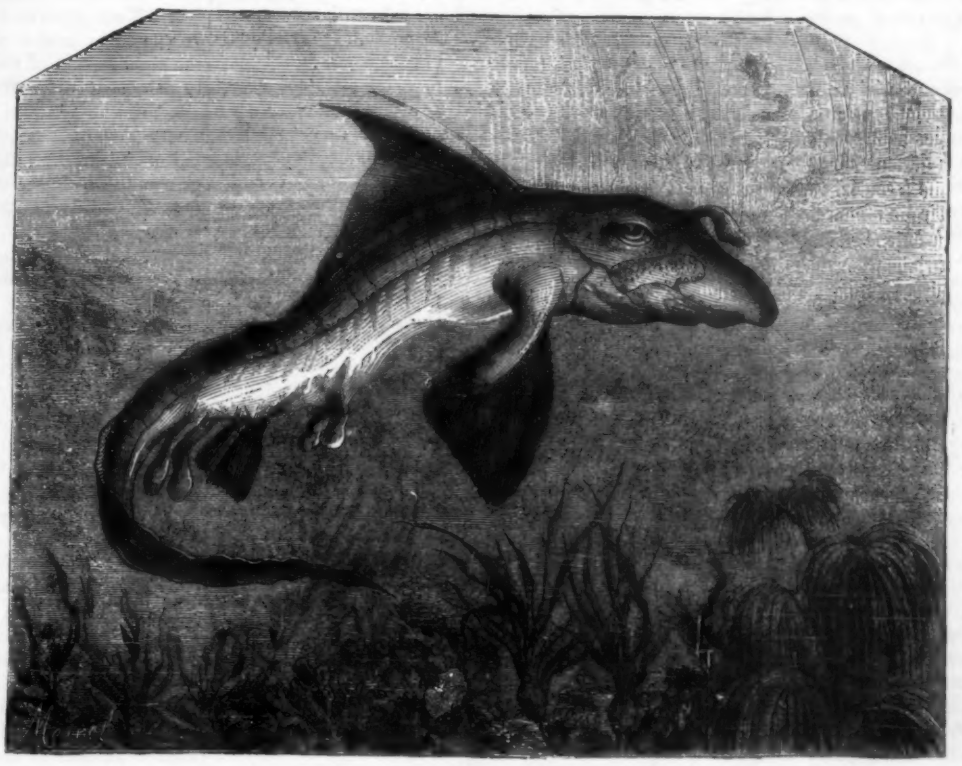
BRASSINGTON'S EXTENSION TABLE.

THE SEA CAT.

"Sea cat" is the popular name bestowed on certain cartilaginous fishes of the order *Holocephala* because of a peculiarity of their eyes, which have a greenish pupil, surrounded by a white iris, and which have the property of shining, especially at night, like the eyes of the cat. These fishes seem to form a group intermediate between sturgeons and sharks.

Nothing is stranger and more ugly in appearance than one of these fishes, especially the species represented in the engraving, and which is well deserving of its scientific name, *Chimæra monstrosa*. It is from three to four feet long, and its body, from the base of its enormous head, gradually diminishes in size and ends in a long slender tail like that of some reptile. Its skin is smooth, elastic, and flabby, of a silvery white, and covered with scales that are so minute that they are scarcely perceptible to the touch. It is thrown into folds and sinuous wrinkles all along the body and on the top of the head, so that it appears to be too large for the body that it envelops. Under the mouth, and on the lateral faces of the snout, it is perforated with numerous holes, from which issues a glutinous mucus. The pectoral fins are supported on a sort of thick fleshy arm. Before and behind the ventrals hang two appendages resembling small paws. Between the eyes there is a large fleshy club-shaped process, with serrated edge, and ending in a spine, which somewhat resembles a crown, and has given rise to one of the popular names of the fish—"king of the herrings." What makes the sea cat still more hideous is its quick and odd movements, bending and twisting as it does, in all possible directions. Besides this, the different parts of its snout are constantly in motion, so that it has the appearance of making grimaces, which have been compared to those made by monkeys. There are two kinds of this fish—the northern sea cat (represented in the engraving) which is found in the North Sea and Northern Atlantic, and the southern sea cat (*Callorhyncus australis*), inhabiting the southern seas. The first of these pursues shoals of herrings and other migratory fish, and also feeds on jelly fishes and crustaceans. Its flesh is tough, but the Norwegians use the eggs (which, as in the sharks, are inclosed in a leathery capsule) as food, and employ the oil of the liver in diseases of the eyes and for wounds.

In the southern sea cat the snout ends in a gristly appendage, bent backward at the end so as to resemble a hoe; the anterior dorsal is very far forward over the pectorals; the second over the ventrals and reaching to the caudal, and the tail does not end in a filament. The singular shape of its snout, which is not unlike that of the tapir, has gained for it the familiar name of "elephant fish." It is about the same size as the northern animal, and is silvery, tinged with yellowish brown.



THE SEA CAT.

JERSEY BULL DIAVOLO.

This bull was the first prize in the yearling class at the New York State Fair in 1880. It is the property of Hon. Erastus Corning, of Albany.

The engraving, from a photograph taken for the *Rural New Yorker*, at the time of the Fair, and reproduced with great faithfulness, is a very correct portrait of this spirited and beautiful animal. That he is "good enough" goes without saying, for he won the highest honor in a large class. The photograph, as usual, slightly exaggerates the legs, perhaps, but the life-like play of light on the hide, the shadows, the spirited pose of the animal, are excellent, and so well preserved that the picture is a source of pleasure simply as a work of art. Diavolo was sired by Stockwell 3d, the noble bull which won the first prize at the same show in "aged" class, and was imported by Mr. Corning. His dam, Tranquillity, is by the same sire, her dam being Daisy Morton, also imported.

JERSEY BULL DIAVOLO.

Black Sheep of Australia.

Mr. Charles Darwin communicates to *Nature* the following extract of a letter from a Mr. Sanderson, of Chilhurst, which seems to explain the reason for raising and scattering black sheep among flocks of white ones on ranches in Australia. Mr. Sanderson writes: "In the early days, before fences were erected and when shepherds had charge of very large flocks (occasionally 4,000 or 5,000), it was important to have a few sheep easily noticed among the rest; and hence the value of a certain number of black, or partly black sheep, so that colored lambs were then carefully preserved. It was easy to count ten or a dozen such sheep in a flock, and when one was missing it was pretty safe to conclude that a good many had strayed with it, so that the shepherd really kept count of his flock by counting his speckled sheep. As fences were erected the flocks were made smaller, and the necessity for having these spotted sheep passed away. Their wool also being of small value, the practice soon grew of killing them off as lambs, or so young that they had small chance of breeding, and it surprised me how, at the end of my sheep farming experience of about eight years, the percentage of colored lambs produced was so much smaller than at the beginning. As the quantity of colored wool from Australia seems to have much diminished, the above experience would appear to be general."

Filtration and Decolorization.

BY C. O. PFANDER, LONDON.

It consists of dried or baked granulated clay mixed with blood to the proportion of about three of clay to four of blood; sometimes a proportion of vegetable charcoal is added. This mixture is moulded into lumps of convenient form, dried, broken into small pieces, mixed with an equal bulk of granulated clay, and then carbonized in a retort. This material, when screened, constitutes the new filtering material especially adapted for treating sugar, etc. The dust screenings will remove color from solutions of sugar and form a new product.

NATURAL HISTORY NOTES.

The Colors of Flowers.—Hitherto it has been supposed that the colors of flowers were due to so many different materials, each color being a chemical combination having no relation with the others. But now, however, Prof. Schuetzler, in a communication to the Vaudois Society of Natural Sciences, shows that, when the color of a flower is extracted by placing the latter in alcohol, the addition of an acid or alkali will give all the colors that plants exhibit. Flowers of pæony, for example, give when put into alcohol a violet-red liquid. If to this solution binoxalate of potassa ("salt of sorrel") be added the color becomes pure red. Soda causes it to change, according to quantity used, to violet, blue, or green. In the latter case the green liquid appears red by transmitted light, just as a solution of chlorophyl (the green coloring matter of leaves) does. The sepals of pæony, which are green bordered with red, become entirely red when put into a solution of binoxalate of potassa. These changes of color, which may be obtained at will, may well be produced in plants by the same causes, since in all plants there are always acid or alkaline matters. Moreover, it is quite certain that the change from green to red observed in leaves in autumn is due to the action of the tannin which they contain on the chlorophyl. Consequently, without wishing to affirm it absolutely, Prof. Schuetzler believes that *a priori* there is in all plants but one coloring matter—chlorophyl—which, becoming modified by certain agents, gives all the tints that flowers and leaves exhibit. As for white flowers, it is well known that their want of color is due to the fact that their cells are filled with a colorless fluid, and that their opacity proceeds from the air contained in the interspaces.

When such flowers are placed under the receiver of an air-pump they are seen to lose their opacity and become transparent in measure as the air is exhausted.

Relation of Fish to the Lime in Water.—In a recent paper by Herr Weith, entitled "Chemical Investigation of Swiss Waters with Reference to their Fauna," he gives a large number of quantitative analyses of the water of Swiss lakes, rivers, and streams, with regard to the proportion of lime and earthy substances generally contained in them. In this research a very interesting relation appeared between the quantity of fish and the amount of lime contained in the water. The result arrived at was that, in general, of the various bodies of water under otherwise similar conditions, those which contain the most *dissolved carbonate of lime* also contain the most fish. The explanation of this fact is also given by the author. The simple carbonate of lime is found largely distributed on the bottom and banks of lakes, etc., but it is insoluble, and therefore cannot be taken up by the water. If, however, the water contains carbonic acid in abundance (which of course is produced by the respiration of animals) this transforms the carbonate into the bicarbonate, which is readily soluble in water. The correctness of this view was proved by the author by experiment. By a sure chemical analysis, then, one may with considerable probability form a prognosis as to the quantity of fish in a body of water, to say what its chemical composition was, and to find his estimate remarkably verified. An important practical consequence would be deducible from these facts, if further experiments should confirm the supposition that not only do

fishes increase the proportion of lime in water, but that, conversely, an abundance of lime in water might have a stimulating effect on fishes. The latter, for their part, produce this carbonic acid which, with lime present in the water, does not escape into the atmosphere, but remains dissolved in water, and so stimulates plant life. Water plants, however, serve aquatic animals as food, and render possible their existence; and thus vegetable and animal life, whose mutual dependence is well known, is maintained by the mediating action of lime in continuous and intimate connection. Experiments on a large scale would decide whether it is possible to transform a body of water on ground which is without lime, and therefore poor in organic life, by suitable addition of carbonate of lime into such as would afford proper condition of life for animals and plants.

Effect of Strong Drink on the Liver.

The *Family Physician* tells us that when alcohol is introduced into the stomach in the ordinary way, it nearly all passes through the liver. Undiluted spirits are much more injurious than when mixed with water, and produce greater irritation. Alcohol consumed as wine or beer is far less destructive to the liver than when taken in the form of ardent spirits. A hot climate intensifies all the vicious effects of alcohol. The symptoms of cirrhosis of the liver are in the early stages often obscure, but later they are sufficiently well marked. At first the liver gets slightly enlarged, and the patient suffers from pain in the right side, indigestion, wind, and costive bowels. He is occasionally feverish, his skin is hot and dry, and he has a peculiar, unhealthy, sallow look, which he probably fails to notice, but which is sufficiently obvious to his friends. The necessity for making a change in his habits is forced upon his attention, and for a week or two he is under the doctor's orders, and not feeling able to drink any more, he consents to follow a restricted diet, and to take a course of purgatives.

Soon the most prominent symptoms are relieved, he fancies himself well again, and quickly returns to his old habits. Gradually, however, he notices that he is getting thinner and weaker, and occasionally he has a good deal of pain in the side. He is nervous and out of sorts. He has no longer the pluck he used to have; first his friends notice it, and then he gradually becomes aware of it himself. He finds that he is not "fit for business," and he is afraid to see people. The patient has occasional attacks of diarrhea, his appetite fails, and the emaciation and debility increase. He tries all kinds of treatment, but never sticks to one for long at a time. He consults every one of any note in London, but derives little if any benefit from their advice. He would give up the drink if he could, but he can't. His self-reliance is gone, the alcohol has stolen away his will, and he is utterly incapable of giving up the dangerous fascination. He will take an oath to-day that he will never touch another drop of spirit, and will probably break it to-morrow. Sometimes he wishes that some one would lock him up in an asylum, or that by some chance or other he could have six months' imprisonment, but he never feels able to put himself under restraint. After a time the liver gets smaller, and this, instead of being a good sign, is a bad one, for it is contracting. He would willingly enough consent to knock off drink now, but it is too late; the mischief is done, the liver is in a state of cirrhosis, and no medicine can restore it to its natural condition. Is there any remedy for this horrible complaint? Yes, one, teetotalism—absolute abstinence from alcoholic liquors of all kinds. This remedy must be applied early. If he waits till his liver has undergone serious organic change, it is too late. No half-measures will suffice; he must give up drink of all kinds. If he does this he will recover; but if he goes on in his old plan an early and painful death is the inevitable consequence.

Exercise and Temperature.

These have been made the subject of a series of observations (about 150 in number, extending over four years) by M. Bonnal. He finds that all muscular exercise raises the rectal temperature. The rise is not, however, in direct relation either to the duration of the exercise or the apparent fatigue. For a given exercise, performed under like conditions, the rise of temperature may vary in different individuals, and even in the same individual. The altitude, the state of the atmosphere, the energy of the movement, the nature and amount of clothing, have a very manifest influence, especially on the rapidity of the rise. Absence or abundance of perspiration has no appreciable influence. The rectal temperature is rarely elevated beyond 38·6° C.; but in one case, that of a runner who, on the 14th of November, ran about 18 kilometers in an hour and a half without stopping, M. Bounal found it 39·5°. (This man showed no accelerated respiration, but merely an increase of pulse to 145 beats.) In rest after exercise the rectal temperature falls, and the more rapidly the shorter the exercise has been. It is noted that all rapid exercise diminishes the peripheric temperature (in the mouth, armpit, or groin), which, on the other hand, rises again directly rest is taken, and after some time the peripheric and rectal temperatures come to their normal difference, 0·2° or 0·3°. If the rectal temperature be over 37°, a moderate exercise (such as walking 20 minutes on level ground) only raises it 0·2° to 0·4°.; but if under 37°, the rise may be more. In rapid ascent it is always after the first half hour that the rectal temperature is most raised; it may then remain stationary, or rise, or even descend a few tenths of a degree. Gymnastic exercise in the horizontal position, and limited to the upper limbs, does not alter the initial temperature. If limited to the lower limbs, it may, in 30 minutes, raise the rectal temperature 0·3° to 0·7°. In general, a rigorous application of the laws of mechanics to the human organism is not justified.

Accumulation of Foreign Bodies in the Stomach.

The following case is reported by Charles L. Dayton, M.D., in the Buffalo *Medical and Surgical Journal*. It demonstrates that in gastric diseases there is great difficulty in forming a correct diagnosis, and also in reaching a reliable prognosis, the problem only yielding a satisfactory solution through a *post-mortem* examination:

Mr. S., aged 45, residing at Black Rock, for a period of six months had complained of gastric pain with nausea, and other symptoms of indigestion. He presented the appearance of one suffering from scirrhus of the stomach or aggravated dyspepsia. Failing to secure relief after consulting several physicians, he consented to accompany me, with a view to consult Prof. Austin Flint, Sr., at that time residing in Buffalo. Prof. Flint examined the patient thoroughly, and expressed the opinion that he would ultimately recover. Two days afterward the patient suddenly died. At the autopsy, in the presence of Drs. L. P. Dayton, Tobie, and Beaman, the stomach was removed. It contained a tumblerful of prune pits; the pyloric orifice was so far occluded by the induration of the surrounding tissues that it admitted only the passage of a small catheter. About three inches from the pyloric orifice the stomach was perforated, probably through the influence of the prunes. His wife stated that he had not eaten prunes in five or six months, and could offer no explanation for his swallowing the pits.

The case is interesting on account of the presence of so large a quantity of foreign substances in the stomach, of the similarity of symptoms to those usually occurring in ulceration and scirrhus, and of the obscurity often attending gastric and intestinal disease, which is cleared up only through the *post-mortem* examination.

Neuralgia as a "Warning."

The great prevalence of "neuralgia"—or what commonly goes by that name—should be regarded as a warning indicative of a low condition of health, which must necessarily render those who are affected with this painful malady especially susceptible to the invasion of diseases of an aggressive type. This is the season at which it is particularly desirable to be strong and well furnished with the sort of strength that affords a natural protection against disease. There will presently be need of all the internal heat which the organism can command, and a good store of fat for use as fuel is not to be despised. It is no less essential that the vital forces should be vigorous, and the nerve power, especially, in full development. Neuralgia indicates a low or depressed state of vitality, and nothing so rapidly exhausts the system as pain that prevents sleep and agonizes both body and mind. It is, therefore, of the first moment that attacks of this affection, incidental to and indicative of a poor and weak state, should be promptly placed under treatment, and as rapidly as may be controlled. It is worth while to note this fact, because, while the spirit of manliness incites the "strong-minded" to patient endurance of suffering, it is not wise to suffer the distress caused by this malady, as many are now suffering it, without seeking relief, forgetful of the condition it bespeaks, and the constitutional danger of which it is a warning sign.—*Lancet.*

Suggestions Concerning Long Life.

If any one could furnish the world with a medicine which would insure a long life, there is no end to the demand he would have for his drug. The *Herald of Health* thinks he would need many factories to make it, and many banks to hold the money he would receive. Fortunately there is no such medicine, and so the world will have to get along in some other way.

Some time ago the French Government sent a circular letter to all the districts of that country to collect information as to those conditions of life which seemed to favor longevity. The replies were very interesting, but on the whole rather monotonous; and the general result was that longevity is promoted by great sobriety, regular labor, especially in the open air, short of excessive fatigue, easy hours, a well-off condition, a philosophical mind in meeting troubles, not too much intellect, and a domestic life. The value of marriage was universally admitted, and long-lived parents were also found an important factor. A healthy climate and good water were mentioned. All this agrees with common sense, unless the idea that the intellect is a hinderance to longevity be considered unreasonable, and we know that some of the most intellectual men have lived to great age.

Soda for Burns.

All kinds of burns, including scalds and sunburns, are almost immediately relieved by the application of a solution of soda to the burnt surface. It must be remembered that *dry* soda will not do unless it is surrounded with a cloth moist enough to dissolve it. This method of sprinkling it on and covering it with a wet cloth is often the very best. But it is sufficient to wash the wound repeatedly with a strong solution. It would be well to keep a bottle of it always on hand, made so strong that more or less settles on the bottom. This is what is called a saturated solution, and really such a solution as this is formed when the dry soda is sprinkled on and covered with a moistened cloth. It is thought by some that the pain of a burn is caused by the hardening of the albumen of the flesh which presses on the nerves, and that the soda dissolves the albumen and relieves the pressure. Others think that the burn generates an acrid acid, which the soda neutralizes.

Sewage, and Rules for Public Buildings.

The following rules, to be observed in the construction of all buildings erected under her Majesty's Office of Works, have been prepared and issued by the Secretary to the Office of Works:

1. All water closets and urinals shall be constructed so that one wall at least of such closets and urinals shall be an outer wall of the building.

2. All soil pipes shall be carried outside the building, and ventilated by means of pipes leading the foul gases above the highest point of the building. Such pipes to be carried to points removed from chimney stacks.

3. Separate cisterns shall be constructed for the water closets and for the general purposes of the building. No tap or "draw-off" shall be affixed to any pipe communicating with a cistern supplying a water closet or urinal.

4. All waste pipes and overflow pipes of cisterns shall terminate in the open air, and be cut off from all direct communication with drains.

5. Great attention shall be paid to insuring thorough ventilation in all rooms. Rooms so high that their ceilings shall be more than two feet above the top of the windows, corridors, staircases, and other open spaces, shall be specially ventilated so as to prevent the accumulation of stagnant air.

6. All main drains should, where practicable, be formed outside the building. In the event of its being necessary to carry a main drain underneath a building, it must be trapped immediately outside the main wall, and a ventilating-pipe must be carried from that point to the highest part of the roof, as under Rule 2.—*Journal of the Society of Arts.*

Pilocarpin in Diphtheria.

Last week fifty-two children died in Brooklyn of diphtheria. Sad reports of similar mortality come from other quarters. It is our duty to call the especial attention of American physicians to the extraordinary success which is now reported in Germany, in this disease, from the *muriate of pilocarpin*. It is given in ordinary doses, internally, and a large number of cases have been reported by different physicians wherein the results were astonishingly good. As soon as the pilocarpin exercises its specific effect on the salivary glands, the false membrane detaches, the inflammatory phenomena disappear, and improvement begins.

We particularly request our readers to try this treatment and report their results, whether good or bad.—*Medical and Surgical Reporter.*

Raspberry Culture Made Easy.

It is a source of constant regret with farmers that small fruits require so much care and attention, and that, too, in the season when they are hardest at work at something else. Field work must be done at all events, and so the "berry patch" struggles on single-handed with weeds and grass till it submits to the inevitable sward. Some years ago, coming into possession of a patch of black-cap raspberries that had received the usual shiftless culture, I treated them in the following way: After carefully plowing and hoeing them, I covered the ground with a heavy layer of strawy manure, and the work was done, not only for that year, but for the two years following, only renewing the mulch each spring. Only a few straggling Canada thistles will ever grow through such a mulch; the soil is always rich and moist, and the berries can ask no better treatment. Since that time I have tried the same plan without removing the sod, and find that the result is quite as satisfactory. Late as it is in the season now, any raspberry plot can be reclaimed by a liberal application from the horse manure pile. Farmers, try it, and you will not need to complain that berries cost more than they are worth.—*J. C. in N. Y. Tribune.*

Sewer Ventilation.

At a recent meeting of the Leith Town Council, Provost Henderson, *a propos* a memorial from certain inhabitants on nuisance said to be caused by the sewer ventilation in the streets, took occasion to address the Council on the principles and practice of sewer ventilation. He described the various means which had been resorted to in different towns to secure ventilation of the sewers, by in-draughts, by out-draughts, by furnaces, by screws, but thought experience had proved that the simpler the means adopted the more effectual the result. In fact, the more numerous and more direct the openings made in the sewers the better the ventilation and the less the nuisance (if any) from sewer air. He, as Mrs. Lirriper with the chimney-cowls and smoke, preferred the ventilation, and the means thereof, *plain*, and this was the general conclusion of competent observers on the subject. If the street ventilators of Leith stink, the evil must be sought not in the ventilators, but in the sewers themselves.

PASTE FOR PAPER.—To ten parts by weight of gum arabic add three parts of sugar in order to prevent the gum from cracking; then add water until the desired consistency is obtained. If a very strong paste is required add a quantity of flour equal in weight to the gum, without boiling the mixture. The paste improves in strength when it begins to ferment.—*Chron. Industr.*

Cotton Manufacture.—Census of 1880.

Preliminary report upon the *specific* cotton manufacture of the United States, exhibiting the number of looms, spindles, the number of bales of cotton consumed, and the number of operatives employed, as reported by Edward Atkinson, of Boston, Mass., Special Agent of the Tenth Census on Cotton Manufacture.

STATES.	Number of Looms.	Number of Spindles.	Number Bales of Cotton Used.	Persons employed, including Agents, Overseers, Clerks, Mechanics, Watchmen, and Operatives.
The United States...	230,223	10,921,147	1,586,481	181,028
Alabama	1,060	55,072	14,887	1,600
Arkansas	28	2,015	720	64
Connecticut	18,066	931,538	107,877	15,497
Delaware	893	48,876	7,512	695
Florida	—	816	350	33
Georgia	4,718	200,974	67,874	6,678
Illinois	24	4,860	2,361	281
Indiana	776	33,396	11,558	720
Kentucky	73	9,022	4,215	359
Louisiana	120	6,096	1,354	108
Maine	15,978	696,685	112,361	11,318
Maryland	2,325	125,014	46,947	4,159
Massachusetts	94,788	4,465,290	578,590	62,794
Michigan	131	12,130	600	208
Mississippi	704	26,172	6,411	748
Missouri	341	19,312	6,309	515
New Hampshire	25,487	1,008,521	172,746	16,657
New Jersey	3,344	232,905	20,569	4,658
New York	12,822	578,512	70,014	10,710
North Carolina	1,960	102,767	27,508	3,428
Ohio	42	14,528	10,597	563
Pennsylvania	10,541	446,379	86,355	11,871
Rhode Island	30,274	1,649,295	161,694	22 228
South Carolina	1,776	92,788	33,099	2,195
Tennessee	1,068	46,268	11,699	1,312
Texas	71	2,648	246	71
Utah	14	432	—	29
Vermont	1,180	55,088	7,404	735
Virginia	1,334	44,336	11,461	1,112
Wisconsin	400	10,240	3,173	282

The Health of Cities.

Statistics compiled by the National Board of Health show that for the year ending October 31, 1880, the more important cities of the world rank as follows in comparative healthfulness. The death rate shows the number of deaths to each 1,000 persons during the year:

City.	Population.	Death Rate.
Chicago	503,298	17·9
Philadelphia	850,000	18·3
St. Louis	333,577	18·8
Boston	375,000	20
Baltimore	393,796	20·9
London	3,254,260	21
Leeds	318,291	21·8
Glasgow	589,598	21·9
New York	1,903,223	23·4
Paris	1,988,806	24
Brooklyn	556,889	25·8
New Orleans	216 359	27·7
Lyons	342,815	27·7
Berlin	1,096,644	29·3
Dublin	314,666	32·9

Luminous Paint.

According to the London *Building News*, luminous paint is getting into quite extensive use in England. Mention is made of offices coated with the paint which give great satisfaction to the occupants. The effect is that of a subdued light, every object in the room being clearly visible, so that in a room so treated one could enter without a light, and find any desired article. The luminous paint is excited by the ordinary daylight, and its effect is said to continue for about thirteen hours, so that it is well adapted for painting bedroom ceilings, passages that are dark at night, and other places where lamps are objectionable or considered necessary. For staircases and passages a mere band of the paint will serve as a guide, and costs but a trifle. For outdoor purposes the oil paint is used, but for ceilings and walls the luminous paint, mixed with water and special size, can be used the same as ordinary whitewash, and presents a similar appearance in the daylight. By the recent discovery that it can be applied as ordinary whitewash considerably expands the field of its usefulness. Sheets of glass coated with the paint are in use in some of the vessels of the navy, at the Waltham Powder Factory, at Young's paraffine works, and in the spirit vaults of several London docks; and now that, by increased production and the use of water as the medium, its cost is reduced by one half, it will probably be extensively used for painting walls and ceilings. The ordinary form of oil paint has already been applied in many ways, to statues and busts, to toys, to clock faces, to name plates and numbers on house doors, and to notice boards, such as "mind the step," "to let," etc. The paint emits light without combustion, and therefore does not vitiate the atmosphere. Several experimental carriages are now running on different railways, the paint being used instead of lamps, which are necessary all day on account of the line passing through occasional tunnels.

Light Road Locomotive Wanted.

A correspondent suggests that this is one of the great needs of the times, and wants us to keep the subject before our readers. He says: "Your suggestions in years past have brought out many valuable inventions. Having been a patron of the SCIENTIFIC AMERICAN for thirty years I know its value. It has been a schoolhouse, workshop, and laboratory to thousands of men who are now in mature life."

Cities Having a Population of 10,000 and Over.—Census of 1880.

State.	Pop.	State.	Pop.
Akron, O	16,512	Malden, Mass	12,017
Albany, N. Y	90,903	Manchester, N. H	32,630
Alexandria, Va	13,656	Marlborough, Mass	10,126
Allegheny, Pa	78,681	Memphis, Tenn	33,592
Allentown, Pa	18,063	Meriden, Conn	18,340
Altoona, Pa	19,716	Middletown, Conn	11,731
Amsterdam, N. Y	11,712	Milwaukee, Wis	115,578
Atchison, Kan	15,100	Minneapolis, Minn	46,887
Atlanta, Ga	34,398	Mobile, Ala	31,295
Attleborough, Mass	11,111	Montgomery, Ala	16,714
Auburn, N.Y	21,924	Muskegon, Mich	11,262
Augusta, Ga	23,023	Nashua, N. H	13,397
Aurora, Ill	11,835	Nashville, Tenn	43,461
Austin, Texas	10,960	Newark, N. J	136,400
Baltimore, Md	332,190	New Albany, Ind	16,422
Bangor, Me	16,857	New Bedford, Mass	26,875
Bay City, Mich	20,693	New Britain, Conn	13,978
Belleville, Ill	10,682	New Brunswick, N. J	17,167
Biddeford, Me	12,652	Newburg, N. Y	18,050
Binghamton, N. Y	17,315	Newburyport, Mass	13,537
Bloomington, Ill	17,184	New Haven, Conn	62,882
Boston, Mass	362,535	New London, Conn	10,529
Bridgeport, Conn	29,148	New Lots, N. Y	13,681
Brockton, Mass	13,608	New Orleans, La	216,140
Brookhaven, N. Y	11,544	Newport, Ky	20,433
Brooklyn, N. Y	566,689	Newport, R. I	15,693
Buffalo, N. Y	155,137	Newton, Mass	16,995
Burlington, Iowa	19,450	New York, N. Y	1,206,590
Burlington, Vt	11,364	Norfolk, Va	21,966
Cambridge, Mass	52,740	Norristown, Pa	13,064
Camden, N. J	41,658	North Adams, Mass	10,192
Canton, O	12,258	Northampton, Mass	12,172
Castleton, N. Y	12,679	Norwalk, Conn	13,956
Cedar Rapids, Iowa	10,104	Norwich, Conn	21,141
Charleston, S. C	49,979	Oakland, Cal	34,556
Chattanooga, Tenn	12,892	Ogdensburg, N. Y	10,340
Chelsea, Mass	21,785	Omaha, Neb	30,518
Chester, Pa	14,996	Orange, N. J	13,206
Chicago, Ill	503,304	Oshkosh, Wis	15,749
Chicopee, Mass	11,325	Oswego, N. Y	21,117
Chillicothe, O	10,998	Oyster Bay, N. Y	11,998
Cincinnati, O	255,708	Paterson, N. J	50,887
Cleveland, O	160,142	Pawtucket, R. I	19,030
Cohoes, N. Y	19,417	Peoria, Ill	29,315
Columbia, S. C	10,040	Petersburg, Va	21,656
Columbus, O	51,665	Philadelphia, Pa	846,984
Concord, N. H	13,838	Pittsburg, Pa	156,381
Cortlandt, N. Y	12,664	Pittsfield, Mass	13,367
Council Bluffs, Iowa	18,059	Portland, Me	33,810
Covington, Ky	29,720	Portsmouth, O	11,314
Dallas, Texas	10,358	Portsmouth, Va	11,388
Danbury, Conn	11,669	Pottsville, Pa	13,253
Davenport, Iowa	21,834	Poughkeepsie, N. Y	20,207
Dayton, O	38,677	Providence, R. I	104,850
Denver, Col	35,630	Quincy, Ill	27,275
Derby, Conn	11,649	Quincy, Mass	10,529
Des Moines, Iowa	22,408	Racine, Wis	16,031
Detroit, Mich	116,342	Reading, Pa	43,280
Dover, N. H	11,687	Richmond, Ind	12,743
Dubuque, Iowa	22,254	Richmond, Va	63,803
Easton, Pa	11,924	Rochester, N. Y	89,363
East Saginaw, Mich	19,016	Rockford, Ill	13,136
Eau Claire, Wis	10,118	Rock Island, Ill	11,660
Elmira, N. Y	20,541	Rome, N. Y	12,045
Elizabeth, N. J	28,229	Rutland, Vt	12,149
Erie, Pa	27,730	Sacramento, Cal	21,420
Evansville, Ind	29,280	Saginaw, Mich	10,525
Fall River, Mass	49,006	Salem, Mass	27,598
Fishkill, N. Y	10,732	Salt Lake City, Utah	20,768
Fitchburg, Mass	12,405	San Antonio, Texas	20,561
Flushing, N. Y	15,919	Sandusky, O	15,838
Fond-du Lac, Wis	13,091	San Francisco, Cal	233,956
Fort Wayne, Ind	26,880	San Jose, Cal	12,567
Galesburg, Ill	11,446	Saratoga Springs, N. Y	10,822
Galveston, Texas	22,253	Saugerties, N. Y	10,375
Georgetown, D. C	12,578	Savannah, Ga	30,681
Gloucester, Mass	19,329	Schenectady, N. Y	13,675
Grand Rapids, Mich	32,015	Scranton, Pa	45,850
Hamilton, O	12,122	Shenandoah, Pa	10,148
Hannibal, Mo	11,074	Shreveport, La	11,017
Hartford, Conn	42,553	Somerville, Mass	24,985
Harrisburg, Pa	30,762	South Bend, Ind	13,279
Haverhill, Mass	18,475	Springfield, Ill	19,746
Hempstead, N. Y	18,160	Springfield, Mass	33,340
Hoboken, N. J	30,999	Springfield, O	20,729
Holyoke, Mass	21,851	Stamford, Conn	11,298
Houston, Texas	18,646	Steubenville, O	12,093
Hyde Park, Ill	15,716	Stockton, Cal	10,287
Indianapolis, Ind	75,074	St. Joseph, Mo	32,484
Jackson, Mich	16,105	St. Louis, Mo	350,522
Jacksonville, Ill	10,927	St. Paul, Minn	41,498
Jamaica, N. Y	10,069	Syracuse, N. Y	51,791
Jeffersonville, Ind	10,422	Taunton, Mass	21,213
Jersey City, N. J	120,738	Terre Haute, Ind	26,040
Johnstown, N. Y	16,626	Toledo, O	50,143
Joliet, Ill	16,145	Topeka, Kan	15,451
Kalamazoo, Mich	11,937	Trenton, N. J	29,910
Kansas City, Mo	55,813	Troy, N. Y	56,747
Keokuk, Iowa	12,117	Utica, N. Y	33,913
Kingston, N. Y	18,342	Vicksburg, Miss	11,814
La Crosse, Wis	14,505	Virginia City, Nev	12,705
Lafayette, Ind	14,860	Wallkill, N. Y	11,483
Lake Township, Ill	18,396	Waltham, Mass	11,711
Lancaster, Pa	25,769	Warwick, R. I	12,163
Lawrence, Mass	39,178	Washington, D. C	147,307
Leadville, Col	14,820	Waterbury, Conn	20,269
Leavenworth, Kan	16,550	Watertown, N. Y	10,697
Lenox, N. Y	10,249	Watervliet, N. Y	23,220
Lewiston, Me	19,083	Weymouth, Mass	10,571
Lexington, Ky	16,656	Wheeling, W. Va	31,266
Lincoln, Neb	13,004	Wilkesbarre, Pa	23,339
Lincoln, R. I	13,765	Williamsport, Pa	18,934
Little Rock, Ark	13,185	Wilmington, Del	42,499
Lockport, N. Y	13,522	Wilmington, N. C	17,351
Logansport, Ind	11,198	Winona, Minn	10,208
Long Island City, N. Y	17,117	Woburn, Mass	10,938
Los Angeles, Cal	11,311	Woonsocket, R. I	16,053
Louisville, Ky	123,643	Worcester, Mass	58,295
Lowell, Mass	59,485	Yonkers, N. Y	18,892
Lynchburg, Va	15,959	York, Pa	13,940
Lynn, Mass	38,284	Youngstown, O	15,431
Macon, Ga	12,748	Zanesville, O	18,180
Madison, Wis	10,325		

Curious Industries.

The work of the staff of officers appointed by the superintendent of the census to collect statistics relating to the industries and manufactures of New York city is, says the *Evening Post*, now approaching completion, and will show, in the opinion of Mr. Charles E. Hill, the gentleman in charge of it, a very satisfactory growth since 1870.

In the course of the investigation by Mr. Hill's deputies some singular industries were brought to light. It was found, for instance, that some use was made of old shoes, but exactly what use was hard to find out. Large numbers of old shoes were sold by rag pickers to certain men who disposed of them at a good price. It is well known that bits of old leather make the commercial article known as Prussian blue, but only a few firms manufacture it, and the new call for old shoes was evidently for some other purpose. In New York city and Brooklyn about three million pairs of old shoes are thrown away every year. Formerly old shoes were plentiful in the gutters of certain neighborhoods; now it appears that they are sought after as choice prizes in the rag picker's line. By dint of persevering inquiry it was discovered that the old shoes were used for three purposes. First, all shoes not completely worn out are patched, greased, and after being otherwise regenerated, sold to men who deal in such wares. Some persons wear one shoe much more than the other; these dealers find mates for shoes whose original mates are past hope. Secondly, the shoes not worth patching up are cut into pieces; the good bits are used for patching other shoes, and the worthless bits, the soles and cracked "uppers," are converted into Jamaica rum by a process known only to the manufacturers. It is said that they are boiled in pure spirits and allowed to stand for a few weeks, the product far surpassing the Jamaica rum made with essences, burnt sugar, and spirits. A gentleman who doubted the truth of this story stopped recently at a low grog shop in the neighborhood of the factory spoken of and inquired if they had any rum from old shoes. "No," said the barkeeper, "we don't keep it much now; the druggists, who want a pure article, all sell it, and the price has gone up. But we have had it, and we can get you some if you want it." How many old shoes go to a gallon of rum could not be ascertained.

It has been noticed by some deputies that while manufacturers are quite willing to put a valuation upon their manufactured product they hesitate about stating the value of the raw material and even return the schedules with the space for the value of raw material left blank. In one instance a manufacturer of tomato catsup returned a report giving the value of his manufactured product at $18,000 and the value of his raw material as nothing. His explanation was as follows: Every year in the coming season he sends to all the wholesale houses which make a business of canning tomatoes clean tubs, with the understanding that the women who trim and peel shall throw the skins and parings into these tubs; every day the tubs are removed, the stuff in them ground up, fermented, flavored, and sold as tomato catsup to the extent of $18,000.

Another singular and decidedly pernicious business is the manufacture on a large scale of cheap candies from white earth or terra alba mixed with a little sugar and glucose. The deputy who investigated the confectionery business reports that seventy-five per centum of some candies is composed of these substances, and such candy, notably "gum drops," contain still less sugar. The effect of white earth upon the stomachs of the unfortunate children who buy these candies is yet to be determined by future autopsies. What is called a fine brand of castile soap has been found to be composed chiefly of this white earth and grease, but the evil effects of such an imposture are trifling compared to the results of turning children's stomachs into miniature pottery works.

Among the new industries which have sprung into existence during the last few years is the system of finishing in this city foreign goods imported in an unfinished condition. Foreign articles composed of several parts are now largely finished in this city, the parts calling for hand labor being imported while those calling for machine work are made here. In this way heavy duties are saved, although the articles are sold as imported goods.

The Photophone.

The opinion is gaining ground, especially among French *savants*, that the musical sounds produced by Professor Bell in disks of various substances, such as mica, India-rubber, metal, and wood, by holding them in the path of a rapidly interrupted beam of light, are really due to heat and not to light. Radiophonic notes, such is the new term, have been obtained by M. Mercadier from ordinary gas lamps without employing lenses to concentrate the interrupted beam, by simply bringing the receiving disk near the source. Even a plate of copper heated to a bright red heat produced very distinct musical tones, which gradually died away as the plate cooled to a dull red followed by obscurity. The fact that when the receiving disks were coated with silver on the side next the light the effects were feeble, and that when coated with absorbent lampblack they were strong, would seem to tell against Professor Bell's conclusion that the sounds were due to light.

It is a curious fact that when the radiometer was first brought out by Dr. Crookes he intimated his belief that its rotation was due to the impact of light waves; but heat is now known to be the cause of the motion.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

The Musical Marvel.—Read the advertisement of the wonderful automatic instrument "Organina," which plays every tune with almost human expression and effect. This is the greatest musical marvel of the age. Indorsed by the m'f'rs of the Chickering pianos and by the best of musicians everywhere. It is the most beautiful and acceptable gift of the season. Order one from the manufacturers or their agents.

Hotchkiss' Mechanical Boiler Cleaner, 84 John St., N.Y., will save your water tax by using well water, hard and limy, even the worst. Engineers make ten per cent selling other parties than employers. Circular free.

Hartshorn's Self-Acting Shade Rollers, 486 Broadway, New York. No cords or balances. Do not get out of order. A great convenience. Sold everywhere by the trade. See that you get Hartshorn's rollers. Manufacturers and dealers in infringing rollers held strictly responsible.

The undersigned, patentee of a new, simple, and effective Water Motor, by which the smallest streams of water may be utilized for motive power, wishes to arrange with parties having suitable facilities to manufacture and introduce the invention. Wm. Lay, Seneca City, S. C.

A trustworthy man of large experience in chemistry and machinery advertises on another page of this paper for a situation. To any manufacturing concern desiring a competent and first-class man for a place of trust, the publishers of this paper have no hesitation in recommending the advertiser. Address A. B., care President of the Third National Bank, New York city.

The surprising results in saving of fuel by the use of Asbestos steam Pipe and Boiler Coverings are worthy the attention of every one using steam. The genuine are manufactured only by the H. W. Johns Manufacturing Company, 87 Maiden Lane, New York, patentees and sole manufacturers of Asbestos Paints, Roofing, etc.

A Weil's Patent Fast Running 10 H. P. Engine, nearly new, in first-class order. John Lahan, 13 Barclay St., N.Y.

The Esterbrook Steel Pen Co. make over 150 varieties of steel pens, and are constantly adding new designs.

Wanted—Steam Engine and Peanut Roaster. F. N. Lang, Baraboo, Wis.

L. Martin & Co., manufacturers of Lampblack and Pulp Mortar-black, 236 Walnut St., Philadelphia, Pa.

Kerosene Stove Wick Trimmer. See illus. article, p. 70, current vol., S. A. Walker & Williams, Sing Sing, N.Y.

Foot Power Machinery for use in Workshops; sent on trial if desired. W. F. & Jno. Barnes, Rockford, Ill.

Large Slotter, 72" x 18" stroke. Photo on application. Machinery Exchange, 261 N. 3d St., Phila.

Burgess' Portable Mechan. Blowpipe. See adv., p. 76.

Steam Engines; Eclipse Safety Sectional Boiler. Lambertville Iron Works, Lambertville, N. J. See ad. p. 60.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Books for Engineers and Mechanics. Catalogues free. E. & F. N. Spon, 446 Broome St., New York.

Driving Clocks for Equatorial Telescopes. Address Th. Fischlein, 158 Pavonia Ave., Jersey City, N. J.

Send to John D. Leveridge, 3 Cortlandt St., New York, for illustrated catalogue, mailed free, of all kinds of Scroll Saws and Supplies, Electric Lighters, Tyson's Steam Engines, Telephones, Novelties, etc.

Saunders' Pipe Cutting and Threading Machines. See adv., p. 45.

Abbe Bolt Forging Machines and Palmer Power Hammer a specialty. Forsaith & Co., Manchester, N. H.

List 25.—Descriptive of over 2,000 new and second-hand machines, now ready for distribution. Send stamp for same. Forsaith & Co., Manchester, N. H.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

Two Patents for sale. R. Munroe, Fitchburg, Mass.

Within the last ten years greater improvements have been made in mowing machines than any other agricultural implement. It is universally acknowledged that the Eureka Mower Co., of Towanda, Pa., are making the best mower now in use, and every farmer should write to the manufacturers for catalogue, with prices.

Jenkins' Patent Valves and Packing "The Standard." Jenkins Bros., Proprietors, 11 Dey St., New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Superior Malleable Castings at moderate rates of Richard P. Pim, Wilmington, Del.

Wood-Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

The "1880" Lace Cutter by mail for 50 cts.; discount to the trade. Sterling Elliott, 362 Dover St., Boston, Mass.

The Tools, Fixtures, and Patterns of the Taunton Foundry and Machine Company for sale, by the George Place Machinery Agency, 121 Chambers St., New York.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch & Shear Co., 33 Dey St., N.Y.

Recipes and Information on all Industrial Processes. Park Benjamin's Expert Office, 50 Astor House, N. Y.

For the best Stave, Barrel, Keg, and Hogshead Machinery, address H. A. Crossley, Cleveland, Ohio.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Downer's Cleaning and Polishing Oil for bright metals, is the oldest and best in the market. Highly recommended by the New York, Boston, and other Fire Departments throughout the country. For quickness of cleaning and luster produced it has no equal. Sample five gallon can sent C. O. D. for $9. A. H. Downer, 17 Peck Slip, New York.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

National Institute of Steam and Mechanical Engineering, Bridgeport, Conn. Blast Furnace Construction and Management. The metallurgy of iron and steel. Practical Instruction in Steam Engineering, and a good situation when competent. Send for pamphlet.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Clark Rubber Wheels adv. See page 29.

Peck's Patent Drop Press. See adv., page 45.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 60.

For Separators, Farm & Vertical Engines, see adv. p. 61.

Blake "Lion and Eagle" Imp'd Crusher. See p. 45.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 60.

Wren's Patent Grate Bar. See adv. page 45.

For Patent Shapers and Planers, see ills. adv. p. 60.

Horizontal Steam Engines and Boilers of best construction. Atlantic Steam Engine Works, Brooklyn, N.Y.

Apply to J. H. Blaisdell for all kinds of Wood and Iron Working Machinery. 107 Liberty St., New York. Send for illustrated catalogue.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Brass & Copper in sheets, wire & blanks. See ad. p. 76.

Diamond Saws. J. Dickinson, 64 Nassau St., N. Y.

The I. B. Davis Patent Feed Pump. See adv., p. 76.

For Superior Steam Heat. Appar., see adv., page 77.

Eagle Anvils, 10 cents per pound. Fully warranted.

Steam Cylinders bored from 3 to 110 inches. L. B. Flanders Machine Works, Philadelphia, Pa.

Machinists' Tools and Special Mach'y. See adv., p. 76.

Houston's Sash Dovetailing Machine. See ad., p. 77.

H. A. Lee's Moulding Machines, Worcester, Mass.

New Economizer Portable Engine. See illus. adv. p. 76.

Catechism of the Locomotive, 625 pages, 250 engravings. The most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for a catalogue of railroad books. The Railroad Gazette, 73 Broadway, New York.

Moulding Machines for Foundry Use. 33 per cent saved in labor. See adv. of Reynolds & Co., page 76.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 77.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Saw Mill Machinery. Stearns Mfg. Co. See p. 77.

Skinner & Wood, Erie, Pa., Portable and Stationary Engines, are full of orders, and withdraw their illustrated advertisement. Send for their new circulars.

Use Vacuum Oil Co.'s Cylinder Oil, Rochester, N. Y

Toope's Pat. Felt and Asbestos Non-conducting Removable Covering for Hot or Cold Surfaces; Toope's Pat. Grate Bar. Chas. Toope, M'f'g Agt., 353 E. 78th St., N.Y.

The Sweetland Chuck. See illus. adv., p. 76.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor, Stiles & Co., Riegelsville, N.J.

Green River Drilling Machines. See ad. p. 60.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) J. R. asks how to mix aniline colors so that they will hold on glass buttons without rubbing off by touching. A. Mix them with a thin colorless varnish (alcoholic), such as bleached shellac or spirit copal.

(2) C. E. N. asks how to soften rattan so as to make neat basket work. A. Coil and steep in boiling water for a time.

(3) C. H. A. asks: Are kerosene heaters unhealthy? A. As commonly used, without means of carrying off the products of combustion, yes.

(4) J. B. asks how to make soap hard and firm. A. Heat the paste nearly to boiling, add plenty of soap, skim off the curds soap which separates, press and let stand to cool. Then cut up and stack in a dry place to harden.

(5) W. B. H. asks if the same cutter is used to cut all the wheels in a set of change wheels for a lathe. I have a lathe, and wish to cut some more wheels, have an index plate and gear cutter, but don't know whether a cutter made from one of the wheels as a pattern would answer for others having more or less teeth. A. Yes, if you shape your cutter to the teeth of a wheel not differing much from the diameter of that you wish to cut. 2. Please give me the title of some good work on amateur mechanics, or some work where I can get some information relative to gear cutting, etc. A. "Shelly's Workshop Appliances."

(6) H. S. asks the cause of the noise in the pipe connecting the range and boiler. The noise is something like that of a steam pump. The pipe connecting my range and boiler has burst twice in as many months, and the plumbers say they cannot account for it, and, therefore, cannot remedy it. The boiler is about 40 gallons size, and is supplied from a tank. The burst has occurred just where the noise is, and the noise does not commence until the water becomes heated. A. The pipe when it leaves the water back must rise gradually and have no place for steam to gather in. Anything which retards the free circulation of the water will cause noise, whether there is a partial stoppage in the pipe or whether the pipes are not properly set. It is excessive heat, with alternate heating and cooling at that part of the pipe, assisted by the ordinary pressure, which causes it to burst.

(7) A. W. asks: 1. Is there a common way of melting German silver? A. Use a black lead crucible, cover with charcoal, and give a good white heat in a small crucible or melting furnace. 2. How can I harden small gouges? A. Heat to bright redness under charcoal and quench in clean water, draw to a purple color. 3. Can you tell me of a way by which I can clean files, such as used by manufacturers of metal show cases; they get filled with soft solder? A. Use a piece of sheet brass or soft hoop iron to detach the metal between the teeth by striking across the file in the direction of the teeth.

(8) C. G. R. asks: 1. At what speed is the boat described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 166, supposed to run with a load. A. Probably eight to eight and a half miles. 2. What wood is best for ribs and keel, and is it bent or sawed into shape? A. White oak; best bent. 3. What wood is best for the hull and how thick? A. Cedar or cypress, five-eighths inch or three-fourths inch thick. 4. Would a four horse power engine answer for this boat? A. Probably it would if the stroke is not too great.

(9) M. J. H. asks for a cheap receipt or process for removing the color from calico prints and colored cotton cloth and bleaching it white. A. Boil in a strong solution of caustic soda, rinse thoroughly in clean water; steep for half an hour in a strong clear solution of chloride of lime (calcium hypochlorite) in water; ring out and pass through water containing about 3 per cent of sulphuric acid, rinse in running water until all traces of the bleaching materials are removed; dry.

(10) W. C. K. asks: What will remove tattoo marks from the skin? A. It is said that milk pricked into the skin in the same way that the ink was originally applied will change the blue color to red and ultimately cause it to disappear.

(11) J. B. D. asks how to make a solution that will take thick grease from steel wire so that it can be immediately dried, without causing it to rust? A. Use a boiling hot solution of potash in water. Bisulphide of carbon and naphtha also readily dissolve grease or oil without rusting.

(12) R. E. N. writes: We have two valuable sleigh robes, which are not used very often; how can I keep them free from moths when not in use? A. Alcohol, 1 pint; camphor, half an ounce; dissolve. Spray with this liquid before storing.

(13) W. T. B. asks (1) how oil of neroli is made. A. The freshly gathered flowers (sweet orange) distilled with an equal quantity of soft water in a retort provided with a condenser. The oil separates from the distilled water, which is returned to the still with fresh leaves. Rectify by redistillation. About 600 pounds of the flowers produce 1 ounce of the oil. 2. How are orange flowers gathered and preserved? A. The flowers cannot be preserved without loss.

(14) C. asks: Can you give me test for grease in glue? A. Macerate the glue with a little pure bisulphide of carbon, draw off the latter, filter quickly, and let it evaporate, in a clean porcelain vessel. The oil or grease (if any) in the glue tested will remain as a residue.

(15) J. S. B. asks why it is that the salts in a storm glass rise to the top of the hermetically sealed glass tube in damp weather, and sink to the bottom in dry weather. A. These glasses are usually not hermetically sealed—the change is chiefly due to the effects of the varying temperature.

(16) F. M. W. asks: What is the method of preparing and using soluble glass in the place of resin, in the manufacture of hard and soft soaps? A. Pure quartz sand, 1 lb; reduce by grinding to a fine powder, and 1 timately mix with 1¾ lb. carbonate of soda deprived of water by calcination. Place the mixture in a retort, capable of holding four times the quantity, and expose to a white heat until the mixture is in a state of calm fusion. Pour out on an iron plate to cool. When powdered it dissolves to a syrupy liquid in boiling water. Consult Feuchtwanger's "Soluble Glass" and Dussauce's "A Treatise on the Manufacture of Soap."

(17) L. G. G. asks: 1. What gas is the lightest? A. Hydrogen. An equal volume of atmospheric air under like conditions of temperature and pressure weigh about fourteen and a half times as much. 2. How much lifting power has it per 1,000 cubic feet? A. If pure, about 109 pounds. 3. How is it made? A. On a large scale usually by decomposing dilute oil of vitriol with scrap iron, or by decomposing superheated steam by passing it over red hot iron. See Giffard's process (illustrated), p. 104, Vol. 38, SCIENTIFIC AMERICAN. 4. If kept in an air-tight vessel will it always remain the same under all conditions of weather? A. If pure, yes.

(18) J. S. asks whether there is any process besides painting, of transferring a photograph on glass for the purpose of showing it in a magic lantern. A. The process of obtaining photographic lantern transparencies is briefly as follows: Clean the glass, coat it with a thin ammoniacal solution of albumen, dry, flow with photographer's sensitized collodion, dip for a few moments in a bath of nitrate of silver, 5 drachms; distilled water, 10 fluid ounces (in a dark room). Adjust the photograph to be copied before the camera and focus. Then put the sensitized glass plate in the dark box, transfer to the camera, expose a minute or two (according to light), then cover, immediately remove to the dark closet and wash the plate in a strong solution of sulphate of iron to develop the picture. Tone in a little warm water containing a few drops of gold chloride, wash and fix by immersion in a strong aqueous solution of hyposulphite of soda or cyanide of potassium, rinse thoroughly dry, and flow with photographer's varnish. Place this in the outer aperture of a dark tube, the other end of which joins the front of the camera, so that the light passing through it enters the lenses of the camera and the image may be focused on the glass plate at the back. Then prepare another sensitized glass plate as before, expose in the camera, develop, tone, and fix as before. This plate will bear a positive image, and may be used directly in the lantern. Consult any good photographer.

(19) J. M. R. asks: By what means can I restore to its original whiteness a plaster vase that has become yellow? It appears to be a mixture of plaster of Paris and oil or wax of some kind, the outside being coated with spermaceti or paraffine. A. While chlorine or peroxide of hydrogen might be tried, we believe that there is no known method of restoring the original purity of a plaster article prepared as indicated. The easiest and most effective manner will be to paint it with a white paint possessing good body, such as Dutch white lead.

(20) E. B. F. asks: Can you give a description of the blue photographic process of copying tracings, etc., used by architects and others? The process is that by which white lines on a dark blue or purple ground are obtained. A. To compress a full description in the small space at disposal in this column would be impossible, but we give hints from which you can work. Brush the paper over with a solution of ferric-oxalate, ten grains to the ounce. This paper will remain good for years, but must be kept carefully in the dark. Expose to light under the drawing that is to be copied, and then brush it over with or immerse it in a solution of ferridcyanide of potassium (red prussiate of potash), by which the picture will be immediately developed, white lines upon a blue ground. The strength of the developing solution is immaterial. The blue color becomes intensified by subsequent washing with a solution of bisulphate of potash. The best sensitizing preparations are those in which ammonia as well as oxalic acid forms a part. Such ammonio-ferric oxalate may be prepared by mixing together oxalate of ammonia, 437 grains; oxalic acid, 386 grains; water, 6 ounces; heating the mixture to the boiling point and then stirring in as much hydrated peroxide of iron as it will dissolve. Peroxalate of iron alone is simply prepared by adding peroxide of iron to a hot solution of oxalic acid in water to saturation.

(21) S. A. C. asks how the iron moulds for cast steel ingots are made. Do they separate at the corners or in the middle of the mould to allow the ingot to be got out? A. The moulds are in a single piece. The cavity into which the metal is poured is made slightly tapering to admit of lifting the mould from the ingot.

(22) G. K. writes: I have a lot of keys that have got badly rusted through lying by for some time. Will you please inform me how to clean the rust off? A. Scour with a little fine emery and oil, if iron; if brass boil in strong washing soda solution, rinse in water, then dip momentarily in strong nitric acid, rinse quickly, rub with a cloth or sawdust and slightly oil.

(23) J. P. B. asks for a recipe for making a cheap black paint for coating canvas. The paint must not crack, and have a good gloss. A. Try the following: Gum amber, 16 oz.: melt in boiling oil (linseed), half a pint; add genuine asphaltum and resin, each 8 oz. Mix thoroughly over the fire, remove to the open air, and gradually add 1 pint of oil of turpentine, slightly warm.

(24) E. T. W. asks: What is used and how prepared and applied for a dressing for carriage tops when they become worn? I have seen one that had been dressed over and it looked as well as new. A. See answer to J. P. B., this page.

(25) J. N. S. asks: How many pounds of iron turning, of vitriol, and of water will it require to make eight thousand cubic feet of hydrogen gas? Can I make it in one vessel or tank, and what size, or will it operate better by using two or more smaller vessels, and of what size? A. About 1,176 lb. iron turnings, 374 gallons strong oil of vitriol, and 45 barrels of water. Better use a number of large, tight hogsheads. Make connection by means of varnished canvas hose, with a short piece of iron pipe driven in a hole in the head of the vessel; 7 lb. iron require at least 12½ lb. acid mixed with about 6 gallons of water. See Giffard's apparatus and process for making hydrogen for inflating balloons, p. 104, Vol. 38, SCIENTIFIC AMERICAN.

(26) J. F. writes: I have in my possession a graduated tube with a bulb on the end loaded with shot; it is marked "Baume for coal oil," temperature 60° Fah. I wish to know how to use it so as to tell the best oil and which is the least explosive. It is marked from 10 up to 75. I have never seen these instruments described by you. A. In Baume's hydrometer for light liquids zero (0°) indicates a specific gravity of 1·075; 10° corresponds to sp. gr. 1·000; 25° to sp. gr. 0·906; 50° to sp. gr. 0·782, and so on. Suspend the instrument in astral oil, which will serve as a good standard; those in which the instrument sinks deeper are of poorer quality. Almost any dealer in optical and philosophical apparatus can provide you with printed tables and explanations of the instrument.

(27) D. V. C. asks if there is any ingredients which would mix with our sizing, composed principally of glue and soap dissolved in water, to prevent

window shades from curling on the sides when exposed to the heat of the sun. A. Try the addition of a trace of glycerine to the size.

(28) C. E. R. asks: 1. Is the pressure the same on the bottom of steam boiler as on the top? A. The pressure is as much greater at the bottom, than the pressure of steam, as is due to the head of water. 2. What is the largest size steam engine cylinder ever made? A. We suppose the largest cylinder is that of the drainage engine at Harlem lake, 144 inches diameter.

(29) J. M. M. asks: 1. With what color are paraffine matches colored? A. Usually the colors are pigmental and not dyes, such as red and yellow lakes, ochers, Prussian blue, and green, etc. 2. If it is aniline how is it applied and mixed? A. The aniline dyes may be introduced by first dissolving them in alcohol. The merest trace of the dyestuff is sufficient. 3. Is there any liquid color for dyeing matches in the market? A. We know of no color sold especially for this purpose.

(30) F. T. R. asks: How is brass made and melted? My experiments have resulted in a blue flame and ashes. A. Yellow brass—zinc, 30; copper, 70; for turning (common) copper, 20 lb; zinc, 10 lb.; lead, 1 to 5 oz. Red brass for turning copper, 24 lb.; zinc, 5 lb.; lead, 8 oz. Red brass, free, for turning copper, 100 lb.; zinc, 50 lb.; lead, 10 lb.; antimony, 44 oz. Another—copper, 32 lb.; zinc, 10 lb.; lead, 1 lb. Best red brass for castings—copper, 24 lb.; zinc, 5 lb.; bismuth, 1 oz; put in bismuth last. In melting use a black lead crucible, put in the copper and heat in a crucible until melted (requires a very bright red, or white heat). When the copper is barely hot enough to remain liquid, add the zinc, with a little borax and charcoal powder. The zinc must be dry. Where lead, antimony, or bismuth is one of the constituents, stir in these just before taking from the fire to pour. Stir with a stick of green wood, skim and pour. In remelting brass use a quick fire and add a little zinc to make up for that invariably lost in the operation.

(31) W. M. C. asks how to put a black bronze on gun barrels. When the guns or carbines are first issued to us they have a lustrous black bronze, which lasts about six months and wears off, leaving the barrel smooth and bright. I think that it is applied with a brush or by a dip, as muriatic acid takes it off clean, leaving the barrel bright. What I need is a recipe such as a soldier can use. I think that a liquid preparation would be the thing, if possible. A. The blue color is due to a thin film of oxide formed in tempering. We know of no way of reproducing the film without reheating the whole barrel. A thin coating of spirit copal varnish, diluted (with alcohol), somewhat and properly colored with aniline blue, may be used to imitate the color and appearance, but it is not very durable.

(32) T. W. asks if a glass ball placed on top of a flag staff on a house is any protection against lightning. A. No, the glass ball would not be any protection from lightning. The proper protection would be a three-quarter inch iron rod, made if possible in one continuous piece, or in sections with soldered and riveted joints, extending from the staff or highest point on the house to the ground, and connected underground with the iron water main pipe or iron gas pipe; the connection between rod and pipe being by soldered joints. This would afford a large area of conducting material under ground in direct connection with the rod. No rod is a protection unless it is thoroughly joined to a large conducting surface in the earth.

(33) J. P. asks for formula for electro-plating iron on other metals. A. Neutral ammonio sulphate of iron (double sulphate of commerce) three-fourths lb.; water, 1 gallon; dissolve and filter. Use a clean iron anode, clean the work thoroughly. (See Nickel Plating, p. 153. Vol. 43, SCIENTIFIC AMERICAN.) Use a moderately strong battery. The success of the operation depends very much upon the preparation (thorough cleansing) of the work. 2. Is the formula given in No. 1, new volume, for electro-plating brass, patented? A. No.

(34) J. H. M. writes: Some makers of boilers, to be used in connection with pipes for heating dwellings and greenhouses by the hot water system, have, in this country and in England, used pipes for grate bars, intending that the water in the boiler should circulate through these pipes, and expecting to obtain greater efficiency from the exposure of more surface to the action of the fire. In what respect is an apparently good theory practically defective, for it seems to have been adopted by but few, and to have been abandoned by some who have experimented with it? A. Such "water grates," as they are called, are not used for economy of fuel, but because they are more durable than the ordinary grate. Coal burning locomotives are frequently fitted with them

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

R P. W.—It is a fine silicious sand, useful for polishing purposes and for glass making; might also find a market with pottery manufacturers and artificial stone makers.

COMMUNICATIONS RECEIVED.

A Plan for the Reformation of the Orthography of the English Language. By H. A. S.

On Solar Phenomenon. By J. C.

NEW BOOKS AND PUBLICATIONS.

EXTRACTS FROM CHORDAL'S LETTERS. New York: *American Machinist* Publishing Company.

These selections from the contributions of "Chordal" to the *American Machinist* make an interesting, entertaining, and usefully suggestive addition to the literature of the machine shop. The author discusses shop work and shop management with much practical shrewdness, and in a manner that mechanics, artisans, and wide-awake working men generally cannot help but enjoy.

YELLOW FEVER: ITS SHIP ORIGIN AND PREVENTION. By Robert B. S. Hargis, M.D. Philadelphia: D. G. Brinton.

Dr. Hargis is an enthusiastic disciple of Professor Gamgee as to the nautical origin of yellow fever, though he professes to have developed the same theory long before. This book comprises a number of articles on the subject published in several medical journals during the past year.

STUDIES IN SONG. By Algernon Charles Swinburne. New York: R. Worthington.

Swinburne's command of singing English is marvelous. His verses are unequaled in sweep and melody. If he could only freight them with thought and feeling of equal quality he would be a poet, and a great poet.

THE SCIENTIFIC BASIS OF SPIRITUALISM. By Epes Sargent. Boston: Colby & Rich. 12mo, pp. 372. $1.50.

Of the two classes of men—those who believe in spiritualism and those who reject the spiritual hypothesis—one must be grievously in error: perhaps both are. We are inclined to think that the one (however correct on the main point) errs as much in denying real phenomena because they are not readily explainable under a too limited theory of what is natural, as the other does in over haste to accept phenomena which are misunderstood or fraudulent, because they tell in favor of that most marvelous of men's inventions—the supernatural. Mr. Sargent's book is not likely to change radically the belief of either class. The natural material out of which men have created and peopled the supernatural, the "invisible universe," the "spirit world," or whatever it may be called, will have to be much more broadly and minutely understood, both as regards its origin and its character, before the question of fact and fancy involved in spiritualism can be brought to any real scientific basis.

SPONS' ENCYCLOPEDIA OF THE INDUSTRIAL ARTS, MANUFACTURES, AND COMMERCIAL PRODUCTS. Edited by G. G. Andre. 30 parts. Each 75 cents. New York: E. & F. N. Spon.

Parts 15, 16, and 17 of this encyclopedia complete the subject of explosives, and embrace feathers, fibrous substances, floor cloth, food preservation, fruit, fur, coal gas, gems, glass, and graphite.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

January 4, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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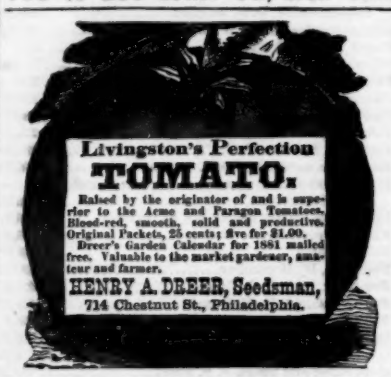
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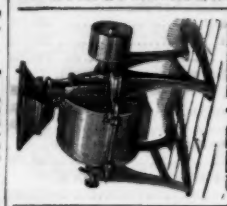
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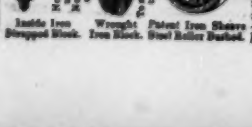

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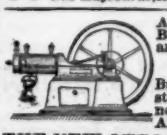

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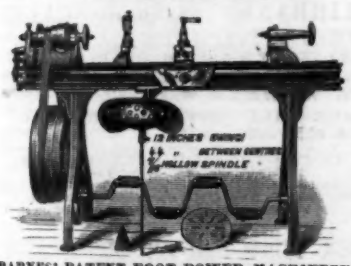

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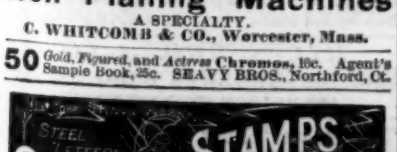

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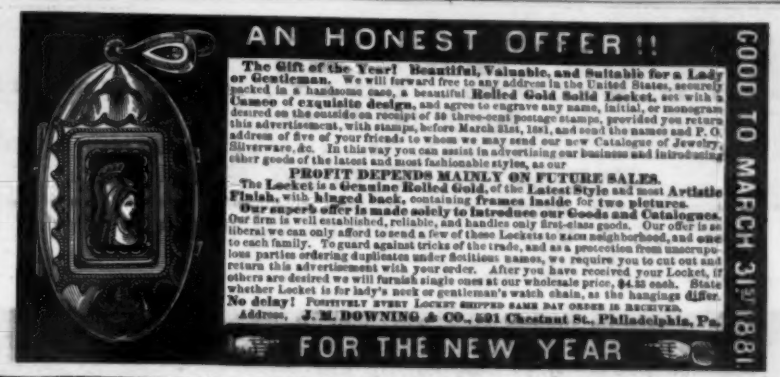
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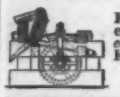

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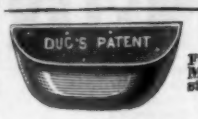

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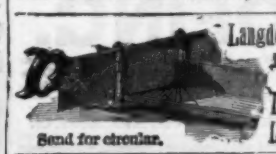

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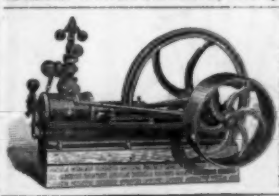

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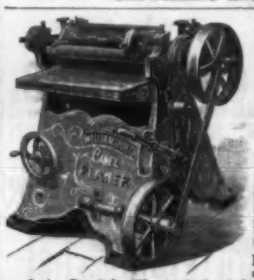

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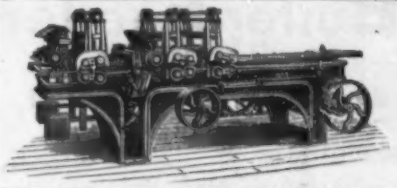

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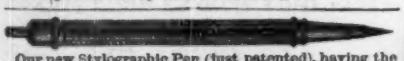

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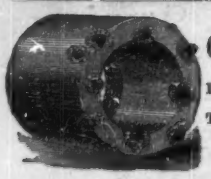

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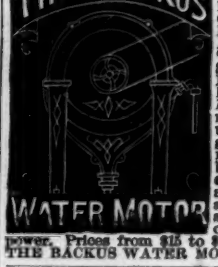

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